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INTERNATIONAL CLINICS

A QUARTERLY

OF
ILLUSTRATED CLINICAL LECTURES AND
ESPECIALLY PREPARED ORIGINAL ARTICLES

ON
TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIAT-
RICS, OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS,
PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY,
OTOLOGY, RHINOLOGY, LARYNGOLOGY,
HYGIENE, AND OTHER TOPICS OF INTEREST
TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION
THROUGHOUT THE WORLD

EDITED BY

W. T. LONGCOPE, M.D., PHILADELPHIA, U.S.A.

WITH THE COLLABORATION OF

WM. OSLER, M.D. JOHN H. MUSSER, M.D. A. McPHEDRAN, M.D.
OXFORD PHILADELPHIA TORONTO

FRANK BILLINGS, M.D. CHAS. H. MAYO, M.D. THOS. H. ROTCH, M.D.
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JOHN G. CLARK, M.D.
PHILADELPHIA

JAMES J. WALSH, M.D.
NEW YORK

J. W. BALLANTYNE, M.D.
EDINBURGH

JOHN HAROLD, M.D.
LONDON

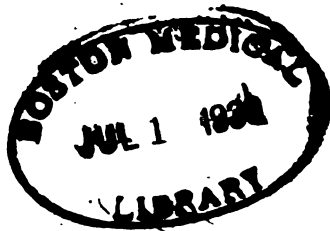
RICHARD KRETZ, M.D.
VIENNA

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CONTRIBUTORS TO VOLUME II

(EIGHTEENTH SERIES)

BEHAN, RICHARD J., M.D., of Pittsburg, Pa.

BUCHANAN, LESLIE, M.D., of Glasgow, Scotland.

CECIL, JOHN G., B.S., M.D., Professor of the Principles and Practice of Medicine and of Clinical Medicine in the University of Louisville, Medical Department; President of the Kentucky State Medical Association; Medical Director for the Inter-Southern Life Insurance Company, etc., etc., Louisville, Kentucky.

CUMSTON, CHARLES GREENE, M.D., Surgeon of the Floating Hospital for Children, Boston, Massachusetts.

DEADERICK, WILLIAM H., M.D., of Marianna, Arkansas.

DILLER, THEODORE, M.D., of Pittsburg, Pa., Neurologist to the Allegheny General and Columbia Hospitals; Visiting Physician to the Psychopathic Department of the St. Francis Hospital; Consulting Neurologist to the Mercy and the Pittsburg Hospitals.

FISCHER, LOUIS, M.D., Attending Physician to the Children's Department of the Sydenham Hospital, and to the Riverside and Willard Parker Hospitals, etc., New York City.

FRANK, LOUIS, M.D., Professor of Gynecology and Abdominal Surgery in the University of Louisville, Medical Department, Louisville, Kentucky.

GILBERT, RICHARD B., M.D., Professor of Diseases of Children in the University of Louisville, Medical Department, Louisville, Kentucky.

GOTTHEIL, WILLIAM S., M.D., Adjunct Professor of Dermatology, New York Post-Graduate Medical School; Dermatologist to the City Hospital and Lebanon Hospital; Consulting Dermatologist to Beth-Israel and Washington Heights Hospitals, New York City.

GRUBER, R., M.D., M.R.C.S., Ophthalmic Surgeon to the German Hospital, London.

HALLOPEAU, H., M.D., Physician to the Paris Hospital.

HUDSON, H., M.D., of Philadelphia, Pa.

MOORE, WILLIAM OLIVER, M.D., LL.B., Professor Emeritus of Diseases of the Eye and Ear, New York Post-Graduate Medical School and Hospital; late Professor of Diseases of the Eye and Ear, Medical Department, University of Vermont, etc.

MUMMERY, P. LOCKHART, F.R.C.S., Hon. Surgeon King Edward VIIth's Hospital for Officers; Assist. Surgeon St. Mark's Hospital for Diseases of the Rectum and The North Eastern Hospital for Children.

ROBERTS, JOHN B., M.D., Professor of Surgery in the Philadelphia Polyclinic Hospital.

SAMPSON, JOHN A., M.D., of Albany, New York.

SIMON, CHARLES E., M.D., of Baltimore, Maryland.

TURTON, EDWARD, M.D., B.Sc., M.R.C.P., Physician to the Hull Royal Infirmary.

VAILLARD AND DOPTER, M.D.'s, of Paris.

WALSCH, JAMES J., M.D., Ph.D., LL.D., Acting Dean and Professor of Nervous Diseases and of the History of Medicine, Fordham University School of Medicine, New York City.

WEBER, F. PARKES, M.A., M.D., F.R.C.P., Physician to the German Hospital, London.

WELLS, H. GIDEON, M.D., of Chicago, Illinois.

WILLMOTH, ARGUS D., A.M., M.D., Professor of Surgery and Clinical Surgery in the University Medical Department, Louisville, Kentucky.

YOUNG, ERNEST BOYEN, M.D., First Assistant Visiting Physician for Diseases of Women, Boston City Hospital; Assistant in Gynecology, Harvard Medical School.

CONTENTS OF VOLUME II

(EIGHTEENTH SERIES)

TREATMENT

	PAGE
THE TREATMENT OF SCARLET FEVER, INCLUDING PROPHYLACTIC MEASURES NECESSARY TO PREVENT COMPLICATIONS. By LOUIS FISCHER, M.D.	1
TREATMENT OF SYPHILIS BY ATOXYL. By H. HALLOPEAU, M.D.	12
TWO YEARS' EXPERIENCE OF TREATMENT BY THE INOCULATION OF BACTERIAL VACCINES. By EDWARD TUSTON, M.D., B.Sc., M.R.C.P.	23
SERUM TREATMENT OF BACILLARY DYSENTERY. By Drs. VAILLARD & DOPTER	48
THE TREATMENT OF HÆMOGLOBINURIC FEVER. By WILLIAM H. DEADERICK, M.D.	54

MEDICINE

THE CHANGES IN THE OUTLINES OF THE HEART, DIAPHRAGM AND STOMACH DURING THE PHASES OF RESPIRATION AS ILLUSTRATED BY THE X-RAY. By RICHARD J. BEHAN, M.D.	62
VALVULAR HEART DISEASE. By JOHN G. CECIL, B.S., M.D.	74
PAIN AS THE CHIEF OR SOLE EXPRESSION OF A PSYCHIC STATE; WITH ILLUSTRATIVE CASES. By THEODORE DILLER, M.D.	86
SOME CURIOSITIES OF LEAD POISONING. By JAMES J. WALSH, M.D., Ph.D., LL.D.	99
RECURRENT TEMPORARY AMBLYOPIA OF ANGIOSPASTIC ORIGIN AND THE ASSOCIATION OF RETINAL ANGIOSPASM WITH OTHER VASOMOTOR NEUROSES. By F. PARKES WEBER, M.A., M.D., F.R.C.P.	111

SURGERY

CLINICAL LECTURE ON RECONSTRUCTIVE SURGERY OF THE FACE. By JOHN B. ROBERTS, M.D.	124
PERINEPHRITIC ABSCESS IN CHILDREN. By CHARLES GREENE CUMSTON, M.D.	138
THE SYMPTOMS AND DIAGNOSIS OF CANCER OF THE LARGE INTESTINE. By P. LOCKHART MUMMERY, F.R.C.S.	155
TREATMENT OF VARICOSE ULCER AND VARICOSE VEINS OF THE LEG. By ARTHUR D. WILLMOTH, A.M., M.D.	164

v

GYNÆCOLOGY

	PAGE
THE CLINICAL MANIFESTATIONS OF UTERINE CANCER. By JOHN A. SAMPSON, M.D.	176
GONORRHOEA AND PREGNANCY. By ERNEST BOYEN YOUNG, M.D.	202
PREGNANCY COMPLICATED BY UTERINE FIBROMATA IN A HEMI- PLEGIC. By LOUIS FRANK, M.D.	211

OPHTHALMOLOGY

THE AFTER-TREATMENT OF CATARACT EXTRACTION. By WILLIAM OLIVER MOORE, M.D., LL.B.	224
THE VISION IN SOME EYE DISEASES. By LESLIE BUCHANAN, M.D. ...	235

DERMATOLOGY

RHINOSCLEROMA. By WILLIAM S. GOTTHEIL, M.D.	244
---	-----

ORTHOPÆDICS

CONGENITAL SCOLIOSIS. REPORT OF A CASE SHOWING SUPER- NUMERARY RIBS AND VERTEBRÆ AND OTHER DEFORMITIES, WITH RADIOGRAMS. By H. HUDSON, M.D.	253
---	-----

PÆDIATRICS

MARASMUS; INHERITED SYPHILIS; SUBACUTE BRONCHITIS. By RICHARD B. GILBERT, M.D.	262
---	-----

PATHOLOGY

ATYPICAL FORMS OF MALIGNANT RENAL HYPERNEPHROMATA WITH CONSIDERATION OF THEIR CHEMICAL CHARACTER- ISTICS. By H. GIDEON WELLS, M.D.	272
RECENT RESEARCH INTO THE PATHOLOGY OF MALIGNANT DIS- EASE. By CHARLES E. SIMON, M.D.	286

LIST OF ILLUSTRATIONS TO VOLUME II

(EIGHTEENTH SERIES)

PLATES

	PAGE
Figure showing relative position of the heart, diaphragm and stomach (Fig. 7)	72
Deformity of nose from specific necrosis in infancy (Figs. 8 and 9)	132
Photographs of deformity due to loss of lobe of the nose and the result after operation (Figs. 19, 20 and 21)	136
Photograph of congenital absence of nose (Fig. 22)	137
Rhinoscleroma, Case I (Fig. 1)	248
Rhinoscleroma, Case II (Fig. 2)	250
Rhinoscleroma, Case II (Fig. 3)	251
Photograph showing contour of spine and tilting of head with elevation of right shoulder (Fig. 1)	254
Photograph showing inclination of body, with no asymmetry of face following torticollis (Fig. 2)	254
Radiogram showing alterations in thoracic and cervical regions of spinal cord (Fig. 4)	256
Radiogram showing alterations in lumbar and sacral regions of spinal cord (Fig. 5)	257
Hypernephroma resembling a lipoma with a sarcomatous stroma (Fig. 1) ..	274
Secondary hypernephroma in left pleura and lungs (Fig. 2)	278
Primary hypernephroma of left kidney (Fig. 3)	279
Primary hypernephroma of kidney, showing a papillary structure (Fig. 4) ..	279

FIGURES

Chart showing temperature and complications in a case of scarlet fever (Fig. 1)	4
Temperature chart; septic nephritis complicating scarlet fever (Fig. 2) ..	7
Outlines of stomach showing peristaltic waves (Fig. 1)	63
Diagram to show outlines of heart, diaphragm and stomach during phases of respiration (Fig. 2)	64
Outlines of stomach during phases of respiration (Fig. 3)	65
Outline of heart in mid-phase of respiration (Fig. 4)	67
Outlines of heart during complete expiration and inspiration (Fig. 5) ..	68
Outlines of left side of heart during contraction (Fig. 6)	69
Diagram to show field of vision in recurrent amblyopia (Fig. 1)	112
Diagram to show field of vision in recurrent amblyopia (Fig. 2)	114
Drawing to show V-flap for oblique ectropion (Fig. 1)	125
Drawing to show tongue-shaped flap from side of face and mandibular region (Fig. 2)	126
Excision of wedge of tarsus and canthoplasty (Fig. 3)	127

	PAGE
Bridge flap from forehead to upper eyelid (Fig. 4).....	127
Drawing to show flap used to fill opening in side of nose (Fig. 5).....	128
Temporal flap to correct ectropion (Fig. 6).....	131
Strap flap from temple to lift up lower eyelid (Fig. 7).....	132
Outline of flaps used to construct new dorsum of nose (Fig. 10).....	134
Diagram to show superimposed flaps when sutured (Fig. 11).....	134
Roberts's method of making nasal bridge with skin flaps (Figs. 12, 13, 14, 15)	135
Method of making nasal dorsum from skin of interocular space by simple sliding (Figs. 16, 17, 18).....	136
Situations in which uterine cancer may arise (Fig. 1).....	177
Everting cancer, vaginal portion of uterine cervix, early (Fig. 2).....	179
Everting cancer, vaginal portion of uterine cervix, advanced (Fig. 3)....	180
Inverting cancer, vaginal portion of uterine cervix, early (Fig. 4).....	181
Inverting cancer, vaginal portion of uterine cervix, extensive local growth (Fig. 5)	182
Inverting cancer, vaginal portion of uterine cervix (Fig. 6).....	183
Inverting cancer, vaginal portion of uterine cervix, superficial but smooth ulceration (Fig. 7).....	184
Inverting cancer, vaginal portion of uterine cervix, necrosis and deep ul- ceration (Fig. 8)	185
Later stage of condition shown in the preceding illustration (Fig. 9)....	186
Inverting cancer, cervical canal, early (Fig. 10).....	186
Later stages of condition shown in Fig. 10 (Figs. 11 and 12).....	187, 188
Early cancer of body of uterus (Fig. 13).....	188
Later stage of cancer of body of uterus (Fig. 14).....	189
Reconstruction of cancer removed at operation (Figs. 15, 16, 17, 18 and 19).....	190, 191, 192, 193, 194
Cancer of uterine cervix involving the vesical wall (Fig. 20).....	194
Cancer of uterine cervix which has involved the bladder (Fig. 21).....	195
Cancer of uterine cervix, with formation of rectovaginal and vesicovaginal fistulae (Fig. 22).....	196
Cancer of body of uterus associated with uterine myoma (Fig. 23).....	197
Localized cancer of cervix (Fig. 24).....	198
Diagram to show deviations in the line of the spinal column (Fig. 3)....	255



Treatment

THE TREATMENT OF SCARLET FEVER, INCLUDING PROPHYLACTIC MEASURES NECESSARY TO PREVENT COMPLICATIONS

BY LOUIS FISCHER, M.D.

Attending Physician to the Children's Department of the Sydenham Hospital,
and to the Riverside and Willard Parker Hospitals, etc., New York City

I SHALL consider first, the treatment of a mild case of scarlet fever, and second, the treatment of a severe case. The mild type of the disease I shall assume is that form which may or may not have a rash. Such cases are atypical. The infection may be limited to the throat. In some cases the infection consists of a rash which lasts one or two days, and then disappears. It is usually followed by a desquamation of a milder or furfuraceous character. These mild cases are the ones which frequently cause great doubt as to the correctness of the diagnosis, and it is only after imprudence in the diet or exposure to cold and chilling of the surface that we will suddenly note the appearance of puffiness under the eyes, or a general puffiness of the face. Associated with this there is scanty secretion of urine. Unless active treatment is instituted and the diagnosis of postscarlatinal nephritis be made, serious if not fatal consequences may follow.

In these mild cases the fever may not go above 102° F., the pulse not over 130, and the child does not appear to be very sick. There is much less toxin absorbed, hence, headache, or delirium or stupor is not found in this condition. The great danger consists in the neglect or careless management of these cases. They suffer little, hence, as the appetite improves there is great danger of overloading the stomach. One of the most frequent complications met with is acute gastric catarrh. It takes place in the following manner: A child that has passed through a febrile stage of scarlet

VOL. II. Ser. 18—1

fever will demand more food, and if indulged by an imprudent mother or nurse will usually suffer with indigestion. There may be fever, vomiting, distention of the stomach and bowels, flatulence, constipation and scanty urine which contains marked traces of indican and acetone. The temperature frequently reaches 105° F., within 24 to 48 hours. This acute gastric infection is primarily due to overfeeding. But we must not forget that the toxin generated in scarlet fever inhibits the secretion of most of the glands of the body. Thus we find glandular inactivity of the entire digestive tract. When the peptic glands do not functionate, food placed in the stomach is not properly prepared for digestion, and as a result it stagnates. The absence of pepsin and hydrochloric acid gives rise to fermentation, and not infrequently the food will stagnate and give rise to a train of dyspeptic symptoms. In like manner the intestinal secretions and the pancreatic juice are absent. This latter ferment is an important adjunct to normal intestinal digestion. Its absence cripples the assimilation of food and gives rise to intestinal indigestion. This toxæmia and its paralyzing effect on the emunctories of the body is so important that I shall take up this subject again later on in speaking of the treatment to be pursued.

What has just been said concerning the mild type of scarlet fever applies with greater force to the severe type of scarlet fever. The clinical picture is very different. We are confronted with continued vomiting, very high fever, the temperature ranging between 103° and 106° F., the pulse between 140 and 150. If the case is first seen when the rash is present, then a severe bluish-red rash covering most of the body will be found.

It is not the purpose of this article to go into the various diagnostic points concerning the different types of scarlatinal eruptions. Those interested may refer to my text-book on Diseases of Infancy and Childhood, published by F. A. Davis Co., 1907.

Statistics—The Willard Parker Hospital is a large city hospital where mild, malignant and septic cases of scarlet fever are sent. Amongst such cases many moribund cases are found and naturally a very high mortality might be expected. This is not the case. It is therefore important to study the treatment and base conclusions thereon.

During the year 1907 there were treated at the Willard Parker Hospital 1477 cases of scarlet fever. Out of this number 124 or 0.8 per cent. died. This low percentage, less than 1 per cent., is due to careful dieting, and enforcement of absolute rest in bed, and the supervision and watching for probable complications.

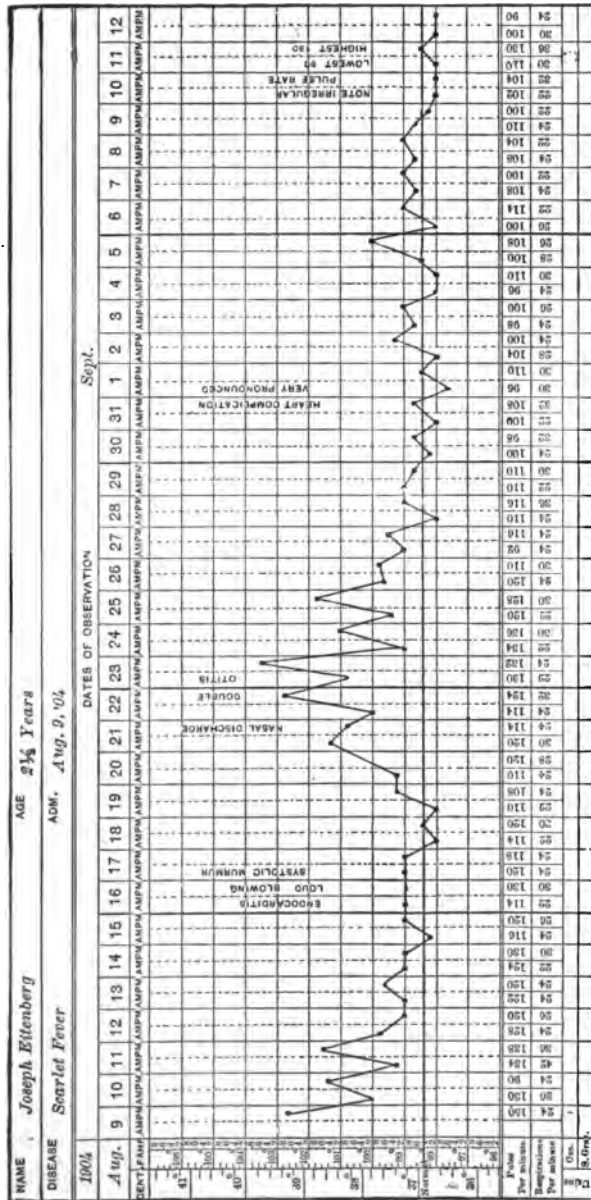
No one should undertake the treatment of a scarlet fever patient without bearing in mind the most probable complications, hence a certain routine can be followed.

A careful study of the foregoing statistics affords convincing proof that the mortality is certainly very low. Bearing in mind that the cases are from the poorer classes whose food and hygiene cannot compare with those of the wealthier class, then the mortality must appear surprisingly low. One would naturally believe that if the same care were bestowed on the wealthier class with good hygienic surroundings plus excellent food, that the mortality should be far lower than we have in treating the children that have been brought up amid unsanitary surroundings. But my greatest anxiety occurs in private practice, first, because it is harder to keep children in bed for several weeks, and secondly, because it is difficult to convince some parents of the necessity of keeping their children in bed for several weeks after a normal temperature has been reached.

The average up-to-date mother looks on the thermometer as her guiding star, and believes that as long as *a febrile temperature exists, sickness abounds, and that when the temperature is normal, convalescence is at hand*, and, *ergo*, she plans to dismiss both physician and nurse. Our duty is plain, and this is one of the most important points I wish to dwell on, namely, to emphasize that the heart action and the pulse should be watched much more closely than the temperature. A feeble, intermittent or irregular pulse with low tension means much more in determining a prognosis than a sudden spurt of temperature.

The scarlatinal poison shows a peculiar predilection for the heart, so that cardiac complications can be avoided only by enforcing absolute rest in bed. Thus I have seen more than one case of severe or malignant scarlet fever escape cardiac and other complications, where strict rest in bed combined with careful diet and general attention to the emunctories was given. Some of the worst cardiac complications encountered were seen in the mildest type of scarlet

FIG. 1.



(From Dr. Louis Faber's Text-Book of Diseases of Infancy and Children. Copyright by F. A. Davis Company.)

Chart showing temperature and complications in a case of scarlet fever.

fever, in which there was a slight rash, very little fever, and the general appearance of a mild attack. Such cases are usually permitted out of bed too soon.

In some cases one week after the rash first appears the child is allowed out of bed and into the street to play with other children and the infection of scarlet fever practically forgotten. It is to these cases that we can attribute many unknown sporadic cases of scarlet fever. These mild cases by reason of their desquamation, frequently disseminate the scarlatinal poison and they are not given serious consideration until some dangerous complication manifests itself.

The ratio of respiration to pulse is one to four, that is, 25 respirations to 100 pulse beats. If we suddenly find that the respiration ratio is disturbed and that we have 50 respirations and 130 pulse beats, less than one to three, then the lung requires careful examination for the presence of some pulmonary complication. A careful physical examination of the lungs is required. It is well to bear in mind that pleuritic effusions and empyema frequently follow severe types of scarlet fever. If an acute process is developing and the sudden disturbance of the respiration ratio is found then we must remember that a central pneumonia may be developing. If the latter process is developing then the physical signs will be obscure or they may be wanting. Cough may be absent so that it may be necessary to make the diagnosis by a process of exclusion. It is important to remember such obscure conditions for, if neglected, such cases may prove fatal.

GENERAL PLAN OF TREATMENT

Fever.—A sponge bath of tepid water, without alcohol, over the whole body, will reduce fever without depressing the heart. It is not necessary to reduce a temperature by sponging, or by tub baths, unless constitutional disturbance such as the twitching of the face or limbs, moaning, delirium or stupor is noted. When the fever gives rise to marked depression, and the child is very apathetic, then a mustard foot bath or a warm tub bath at a temperature of 100°–102° followed by a pack in warm sheets covered with a warm blanket will promote diaphoresis and reduce fever. The bath should be given no longer than two minutes. The pulse should

be watched while the child is in the bath. If the temperature has been reduced and the child is comfortable then the bath should not be repeated. On the other hand, I have seen excellent results follow the use of a warm tub bath. In septic cases with somnolence and delirium, such baths may be repeated every four to six hours. If the heart action is poor, then 1/100 grain strychnia may be given by mouth or by hypodermic injection prior to each bath.

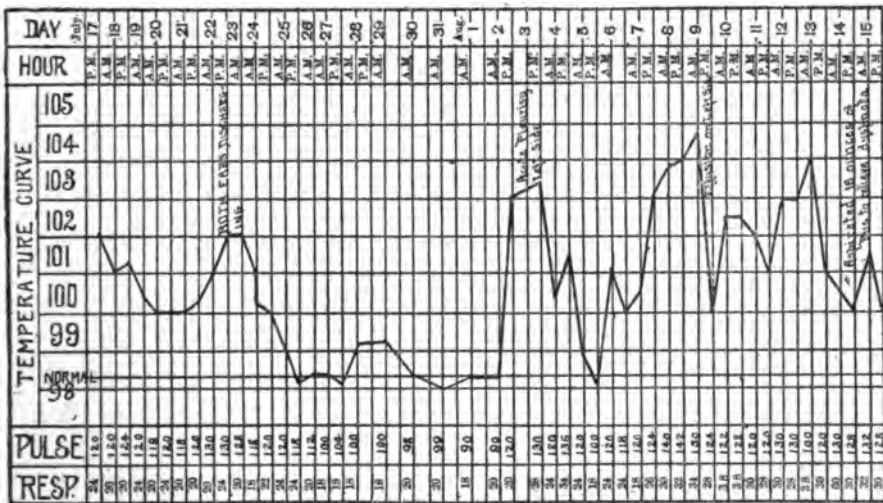
Some cases of malignant scarlet fever do better if placed in a tub of water having a temperature of 100 at first and then gradually cooling the bath by adding ice cold water until the temperature of the water is 80. The question of shock must be carefully considered and therefore the water should be gradually cooled to avoid too rapid chilling. The temperature will sometimes be reduced by placing an ice-cap on the head after the bath. Some cases will require an ice-bag over the heart as well as on the head. The latter method I use if the temperature is over 105.° Repeated mustard foot baths without moving the child from the bed may be given if fever and delirium persist. These baths are made by adding two teaspoonfuls of mustard to two quarts of warm water.

Attention to the Bowels.—Fever will invariably be reduced by emptying the bowels, hence a soap water enema should be given at the beginning of each treatment. In addition thereto several grains of calomel or a teaspoonful of rhubarb and soda mixture may be given every hour until six doses have been given. Fecal stagnation implies the presence of toxins. This must not be permitted with a child sick in bed and deprived of exercise. I have previously alluded to the absence of the glandular secretions, hence peristalsis must be stimulated and aided by mild and gentle catharsis. What applies to the stomach and bowels applies with equal force to the liver, and hence one must stimulate the flow of bile during scarlatinal infection. Two drugs should be remembered, first, calomel, second, phosphate of soda. They not only produce liquid discharges but also aid the secretion of bile. Fever will be less troublesome if closer attention is given to the stomach and bowels during the course of the disease. Having given the initial dose of 2 to 5 grains of calomel, it should be followed in one-half dozen hours with 5 to 10 grains of sodium phosphate. Gentle catharsis and diuresis can then easily be maintained by giving

several wineglassfuls of citrate of magnesia, each day, in divided doses.

Concerning Fever Drugs.—Antipyrin, phenacetin, and quinine are entirely out of place owing to their depressing effect in scarlet fever. They are contraindicated and should never be given. Tincture of aconite in one minim doses (formula U. S. P., 1890) may be given and repeated once every three hours, for an infant one year old. For older children, one minim every two hours may be administered as an antipyretic. Persistent fever during the course of scarlet fever means the presence of complications. If a tempera-

FIG. 2.



(From Dr. Louis Fisher's Text-Book of Diseases of Infancy and Children. Copyright by F. A. Davis Company.)

Septic nephritis complicating scarlet fever. From my service at the Riverside Hospital.

ture behaves normally it drops by lysis. If it suddenly rises then a complication should be looked for. I have frequently seen cases of scarlet fever during my service at the Riverside Hospital in which an empyema, and in one instance an endocarditis, and in another instance a double mastoiditis was found, and still normal temperatures prevailed, therefore we must not believe that the temperature alone should be the criterion by which we can exclude a complication. This matter of temperature during scarlet fever is so important that I took occasion to call attention to it in a paper read before the New York State Medical Association, June, 1907,

entitled "Clinical Observations in Scarlet Fever, with Special Reference to the Heart and Other Complications, and Therapeutic Suggestions."

Kidneys.—The emunctories of the body, chiefly the bowels and kidneys, must not be choked up. Toxins stored in the kidneys and bowels not only give rise to temperatures but frequently may cause convulsions. The tendency of the toxæmia is to disturb normal secretory and excretory functions, and hence, during the recumbent position of a child in bed, a mild laxative as previously outlined, or combined with a diuretic is advisable. The simpler remedies such as 10 to 20 drops of sweet spirits of nitre are well borne. If, however, diuresis is scanty then diuretin in 3 to 10 grain doses several times a day is worth trying. Warm fomentations applied over the kidneys will sometimes stimulate diuresis. I have frequently found that the urine was increased after the application of several dry cups applied in the dorsal region directly over the kidneys. A hot bath combined with warm blankets wrapped around the patient will frequently cause an increased flow of urine. It is advisable to withdraw salt as much as possible from the diet, hence a salt free diet should be ordered until the kidneys functionate properly. Warm demulcent drinks, warm lemonade to which 5 or 10 grains of citrate of potash has been added is very useful.

The Nasopharynx.—The presence of necrotic patches in the nose and throat, especially on the tonsils and pharynx, requires heroic treatment. A culture should invariably be made or a smear taken from the visible necrotic patches and the identity of the pathogenic bacteria ascertained.

Immunizing Dose of Antitoxin.—Regardless of the presence of diphtheria, every case of scarlet fever should in the early stages be injected with 1000 to 2000 units of antitoxin. This is to be given as a prophylactic dose of serum to prevent the complication of diphtheria. In a careful study of scarlet fever cases that were so treated at the Riverside Hospital we found that the complication of diphtheria was greatly lessened by such preventive treatment. This same method is also in vogue at the Willard Parker Hospital of this city. Each and every case receives an immunizing or prophylactic dose on admission to the hospital. If the culture or smear shows the presence of Klebs Loeffler bacilli, then the treat-

ment of diphtheria must be given regardless of the presence of scarlet fever. The nasopharynx should be cleaned to wash away exfoliated or loose necrotic membrane. The best plan is to place the child on its side and irrigate the upper nostril. By this plan we can avoid washing infected discharges into the Eustachian tube. The pharynx should also be washed if loosened membranes are found. For this purpose I have found that a syphon of seltzer water to which a rubber tube is attached can be brought to play on the tonsils or pharynx with sufficient force to wash the throat clean. If the child is unconscious, in a semi-stupor or objects to the treatment, then the metallic mouthpiece of the seltzer syphon can be used also to separate the jaws while such treatment is given. For the nasal solution I prefer a half per cent. permanganate solution or the normal salt solution. The nose and pharynx should be so treated at least two or three times a day unless the nasal discharge is so profuse that active treatment is more frequently demanded.

Swollen Cervical Glands or Lymph Adenitis.—Swollen lymph glands are usually due to the absorption of toxins from the nasopharyngeal pseudomembranes. That these two conditions are associated can be proven by the fact that when the necrotic membranes are washed away and the nasal discharges removed such swellings are greatly reduced or in some cases entirely disappear. Not infrequently when not properly treated and the nasopharynx is not carefully cleaned of the septic debris and purulent discharges, these glands will not resolve but the inflammation will continue, finally breaking down and terminating in suppuration. In the very beginning some good may be done by rubbing into the glands the compound iodine ointment. This should be rubbed in at least several minutes and several times a day. An ice-bag may be applied for an hour or two and then followed by a hot flaxseed poultice. These warm fomentations are far more agreeable and more soothing to the patient, and they certainly aid resolution of these swollen lymphatics.

The constant presence of necrotic membranes in the nose and throat will increase the toxæmia, and hence the cleansing of the nasopharynx by means of nasopharyngeal irrigations is indicated. The danger of infecting or transmitting infected discharges into the Eustachian tube must always be borne in mind and hence, if

using a fountain syringe, my plan is to hold the same no higher than two feet above the child's body, thus limiting the hydrostatic pressure. When using a small glass nasal syringe the normal salt solution or permanganate of potash solution should be injected slowly at body temperature. These injections may be repeated several times a day as previously stated.

Suppurating Complications—Purulent otitis, empyema, vaginitis.—During the course of convalescence children frequently show marked restlessness. They are peevish and irritable and suffer with insomnia. Some cases will show normal temperature and this latter point must be remembered because *pus may be present in spite of normal temperature*. In such cases I have frequently found that the differential blood count was of some value in showing the presence of pus. A marked leucocytosis with a polynuclear percentage of 80 or over, indicates a probable suppurative condition. At any rate when it is considered that a normal polynuclear percentage in a child is about 50 then a higher percentage means inflammation and probably pus. I have verified this at the bedside during my hospital service many times. Thus it is important to examine the ears at the slightest evidence of irritability with or without fever, and not wait for a spontaneous rupture of the drum membrane. In like manner the thorax should be carefully examined, bearing in mind that pleurisy with effusion may possibly terminate in empyema.

Vaginal catarrh is a very frequent sequel to scarlet fever. I have seen many cases follow scarlet fever in spite of the most rigid prophylactic measures. When it occurs a smear should be taken and examined for the presence of the gonococcus. The local treatment consisting, first, in absolute cleanliness; secondly, the intravaginal injections of a 20 per cent. aqueous argyrol solution. This injection is to be repeated twice a day until the flow ceases. Every case of vulvovaginitis demands strict isolation, hence a child so affected must sleep alone and all soiled linen must first be carefully disinfected by immersing it in Labarague's solution or bichloride of mercury solution before being placed in the general wash. When such catarrhal processes exist then the nutrition of the body must be aided by restoratives.

Restorative Treatment.—Citrate of iron and quinine in 5 to 10

grain doses given three times a day in water after meals is a very good restorative. If the appetite is poor strychnine 1/100 grain, 3 times a day or tincture of nux vomica 3 to 5 drops, depending on the age of the child, may be given during the day. Cod-liver oil and the malt extracts are excellent restoratives and may be given after meals.

If nephritis has been severe then a change of climate from north to south may be demanded to escape the rigorous winters and rapid changes of climate in the north. In summer a change of air from city to country or a few weeks of mountain air at an altitude of 1000 to 2000 feet will prove advantageous.

TREATMENT OF SYPHILIS BY ATOXYL

BY H. HALLOPEAU, M.D.

Physician to the Paris Hospitals

IN a paper read before the Academy of Medicine recently, Laveran went into the details of the remarkable results that have been obtained in the treatment of sleeping sickness by the use of sodium anilarsinate, or atoxyl. It is my intention to-day to refer to the powerful effect this drug also has on the *treponema pallidum*, and to call attention to the extent to which it is entitled to enter into current use.

When it had been proved that this arsenical compound destroyed the *trypanosoma*, the analogies in structure between this parasite and the *treponema pallidum* led different pathologists (among others should be mentioned Professor Lassar) to experiment with it as a treatment for syphilis; this attempt was furthermore justified by the fact that Uhlenhut, Gross and Bickel had (January, 1907) demonstrated the destructive action of atoxyl on the spirochæte of chickens. The results obtained by Lassar were at the beginning very unsatisfactory, and at the end of his first set of tests he came to a negative conclusion as regards the value of this substance in the treatment of syphilis. But his failure was really due to the fact that the doses given were not large enough; for he had at this period only injected twenty centigrammes every other day.

Salmon, working at the Pasteur Institute under Metchnikoff, and taking into consideration the quantity of the drug that is tolerated by patients with sleeping sickness, administered it to syphilitic patients in corresponding doses; but he soon perceived that the *treponema pallidum* is more resistant than the *trypanosoma*, and that it does not suffice, in order to prevent the evolution of syphilis, to introduce a gramme and a half of the drug into the system. He then repeated his experiments with larger doses, and obtained such striking results that he reported them to the

Society of Biology in two papers that attracted a good deal of attention.

In his second paper he recommended doses of half a gramme, repeated every other day during two or three weeks; at that moment he had already twenty-seven cases which showed the beneficial effects of this method and he reported: "The favorable modifying reaction appears at all stages of syphilis; the drug is rapidly absorbed and acts quickly; the papulæ fade after three days, ulcerations heal up, gummata are absorbed in a short time, and pain disappears; the amount of atoxyl injected has reached grammes 6.30 in the space of three weeks; cases of intolerance, characterized specially by nausea, vomiting and colics, are unusual and of short duration; such disturbances cease in a few hours on the administration of opium."

I had occasion to follow several of Salmon's early cases in my wards; we have still there an old woman with uterine carcinoma, œdema of the limbs and albuminuria, who at that moment had an ulcerated syphilide of the corner of the mouth, measuring two and a half centimetres in diameter and being of more than a year's duration; five injections, varying from 0.60 to 0.75 of the drug, brought about complete cicatrization of this ulceration in about two weeks' time, and at present, two months after the last injection, there is no sign of relapse. In the case of another patient I also saw a papular syphilide disappear in a few days.

Encouraged by these results I have submitted every patient I have seen to this intensive atoxyl treatment under conditions that made it feasible to follow the results of the treatment, both in private practice and at the hospital; and so active is the movement in our wards at Saint-Louis that in five weeks' time I have collected seventy-two cases. In all of these I used a ten per cent. solution, and the injections were made in the part of the gluteal region considered the best for injections of gray oil; the amount injected has varied from 0.50 to 0.75; the number of injections, three a week, per patient, has varied between five and nine; and I selected, as a rule, patients not under the influence of a mercurial treatment, except when a fresh outbreak of symptoms had occurred in the course of treatment by mercury.

The favorable results that I have observed have fully con-

firmed those obtained by Salmon; the efficiency of the drug has appeared to be specially striking with patients manifesting roseola, papular syphilides and tertiary ulcerations; exostoses retroceded; pain ceased rapidly; and with one patient, suffering from precocious malignant syphilis, whom I have seen several times during the last two years, and whose manifestations resist an extensive treatment with mercury and iodide,—ulcerations as large as a franc healed up entirely after the sixth injection of 0.75 of atoxyl. Ulcerated secondary syphilides proved more stubborn in some instances, and yet I have seen a number of papulo-ulcerous syphilides of the large and small labia, a region where they are usually very difficult to treat, heal up under injections of atoxyl. The only case of this class that proved entirely refractory was that of a young man with labial chancres; an eruption of roseola disappeared in this case in a few days, but the ulceration resisted in spite of ten injections. The explanation of this anomaly was that secondary hospital rot had complicated the syphilitic manifestations. One case of squamous syphilis of the palms of the hands also proved stubborn; but as the patient left town after the fifth injection, I do not know what became of her. In the same manner vegetating condylomata, in which there is an association of microbes, resist the treatment. Finally I must point out its entire inefficiency in cases of lingual leucoplasia. This is accounted for by the fact that this lesion is no longer a syphiloma but a syphilitic deuteropathy, on which no specific treatment has any effect.

In a paper read last May by Professor Lassar before the Berlin Medical Society he reported that in twenty-five cases treated by injections of half a gramme of atoxyl every other day, similar results were obtained, except in a case of iritis.

If these are combined with my cases and with those of Salmon, they make a total of 124, and they demonstrate beyond peradventure the powerful action of atoxyl on all of the direct effects of the treponema. This action is such that in all likelihood it would be possible to cure syphilis just as the sleeping sickness can be cured, were it feasible to continue the treatment for a sufficient length of time without harm to the patient. Unfortunately this is not the case, for there is a shadow on the picture, to which I must now refer.

In spite of the name that has been given to it, and that it does not deserve, sodium anilarsinate is a poison, that is in itself capable of bringing on symptoms often very disagreeable; then accidents occur inevitably if the treatment is prolonged, and it then has to be discontinued immediately. Although as a usual thing the ill effects are of little importance and short duration, they are sometimes extremely disagreeable, and even in exceptional cases quite alarming; thus abdominal pain may be extremely violent, the patient complaining of intense cramps, and the weight of the clothes being intolerable. At the same time there may be diarrhœa, nausea or vomiting, cold extremities, and dysuria; one young woman had attacks of fainting; these symptoms may continue for forty-eight hours. I have also seen under these conditions eruptions, characterized either by erythematous spots, by lumps accompanied by redness of the pilosebaceous follicles, or by petechiæ. Among the 124 cases referred to, there were four in which the symptoms assumed this very distressing form.

Still, there is no more reason why they should lead us to abandon so energetic a means of treatment as atoxyl, than that the mishaps which occasionally arise from the use of chloroform, mercury, digitalis, cocaine and other drugs, should proscribe them from medical practice; as a matter of fact there is no active remedy which, when given in large doses, or inadvisedly, may not prove toxic. If, as at present one seems authorized to believe that syphilis can be advantageously modified in its development by the new arsenical treatment, these signs of intolerance, however disagreeable they may be, may be considered as of secondary importance; but it is our duty to endeavor to avoid them in every possible manner, and we hope to succeed in doing so.

In this respect we have to consider the origin of the drug, the size, weight, age and general condition of the patient, his idiosyncrasies, the size and number of doses, and the duration of the intervals between them.

A.—The quality of the drug. Atoxyl undergoes spontaneous changes; at the end of two weeks it has a tendency to decompose, in the course of which process there may arise products of still greater toxicity. It is therefore essential always to make use of a freshly prepared article. Similar changes arise when the remedy

is heated for a certain time at 100°C.; consequently the usual methods of sterilizing cannot be employed with this drug.

B.—The atoxyl that we have used came from two sources; one was prepared by the German firm that owns the patented name atoxyl; the other was supplied by a French house. We found that the first sort gave rise to signs of intolerance in 50 per cent. of cases; the second, in 17 per cent. It therefore would seem that the former is noticeably more toxic than the latter. Still, it is possible that other factors intervene. We have seen with what facility the drug deteriorates; it may be that the mode of preparation is the cause of this difference.

Whatever may be the difference between the samples derived from the two sources as regards their toxicity, their therapeutic action is identical. Thus, with the German atoxyl we saw a severe, generalized papular syphilide, causing the patient great inconvenience as it hindered his moving about in public, disappear entirely from his face in a few days, and only remain on his body in the form of spots; in the same manner a patient treated with the French product was relieved in five days, after a single injection, from psoriasiform eruption all over his body. Such instances could be multiplied.

An argument that goes to prove the greater toxicity of the German atoxyl is the occurrence of serious accidents when much smaller doses are employed than those we used. Brenning's cases could be cited as examples. He gave one patient 1.80 grammes in two injections, and 2 grammes in twelve injections to another. The former was seized with headache, vertigo, prostration, fever, anorexia, vomiting, deafness, and dryness of the throat, and two days later, with complete retention of urine necessitating the use of the catheter, and with dry cough and somnolence; the other presented very similar phenomena. In the same way Waeloch observed serious accidents after the administration of 2.64 grammes in twenty-four injections. But for my part I have been able to give 5.50 grammes and even 7.50 in fifteen cases with impunity in three weeks' time, although this dose is too large. Was the product I used the same as that used by the above writers? It is difficult to believe this. I cannot think that our confreres in Germany have all used the same article, since Schild has reported 1,500

injections without serious accidents; the contrast between his experience and that of Brenning and Waeloch is too great. This is a pharmacological point of great interest; it affects clinical results, and may lead to unjustifiable conclusions against the drug.

C.—The patient's size and weight must be taken into consideration. Two patients with whom we observed serious accidents were women of small size; with one of them we had reduced the dose to 0.40 gramme, and the signs of intoxication appeared after the fourth injection. In exceptional cases, however, patients of great height and weight may show signs of intolerance very rapidly.

D.—The patient's age must also be borne in mind. I have not yet had occasion to give the treatment to children; but in the case of an old man, though remarkably robust and well preserved, accidents temporary though very severe, occurred after 1.75 grammes of German atoxyl, given in three injections with two days between each.

E.—The general condition of the patient's health is likewise important, as it would be manifestly imprudent to give large doses in albuminuria or heart-disease, though even in such instances there is no absolute rule; thus the old woman referred to above was at the last stage of cachexia, with half a gramme of albumin per litre, and yet she bore perfectly well five injections of 0.70 to 0.75 gramme. On the other hand, one of my leprosy cases was quite ill after four injections of 0.50 gramme.

F.—In certain cases the intolerance that shows itself can only be explained by the method of organic reaction called idiosyncrasy; one of our patients had already on former occasions reacted more severely than other persons around her, in presence of accidental poisoning.

G.—The series of injections should not be unduly prolonged, and the German confrere who in the space of three months administered 27 grammes of atoxyl was certainly to blame for the retrobulbar optic neuritis that developed in his patient.

Accumulation of the Drug in the System.—We have just remarked that, at the indicated dose, signs of intolerance never occur, to any degree at least, after the first injections. Of this we have ample proof in the treatment employed against the trypanosoma, where the initial dose of 1.50 grammes is perfectly well tolerated.

But this tolerance ceases to hold good if the remedy is given several times in succession in the doses indicated by Salmon. True, I have been able to give without trouble as many as eight injections of 0.75 grammes, followed by two of 0.50 grammes; but this is quite exceptional, and as a rule signs of intolerance appear at the end of from five to eight injections. This fact shows beyond question that the drug accumulates in the system.

This intolerance can only be due to the dissociation of the drug that has accumulated in the blood and tissues; it is not possible to explain in any other manner the extraordinarily sudden manner in which the symptoms appear, without any premonition whatever. One of our patients had in the morning received a fifth injection of half a gramme of atoxyl; in addition she had taken since the previous day 0.25 grammes in the form of a solution prescribed for frequent brushing of her patches of lichen of the mouth. She had been out walking during the day without the slightest feeling of ill-health, and it was not until evening that the very alarming accidents of intolerance appeared with absolute suddenness.

This abrupt, unlooked-for appearance is common; and this would certainly not be the manner in which these accidents would occur if they were not due to the gradual increase of the drug introduced into the system. It would be little by little, as the reserve accumulated, that the signs of intolerance would show themselves. In my opinion the early appearance of signs of intolerance, and their gravity, depend on the simultaneous dissociation of the drug and on the degree to which this occurs, which factors in turn depend on the chemical composition of the tissues and humors. The solution of the problem will lie in the discovery of some more stable product than our present atoxyl.

Duration of a Series of Injections.—In his second report to the Society of Biology, Salmon recommended that half a gramme of atoxyl should be injected daily for two or three weeks; but since that time he has modified his ideas on the subject, and he now advises that each series should not comprise more than six injections. Even at this reduced rate accidents occur, if the injections are made every second day; thus, in my cases twice there was intolerance after the fifth injection, once after the fourth, and twice after the third.

Prophylaxis Against Intolerance.—The various details that have been enumerated above, lead me to recommend the following course of procedure. With a patient of average constitution give first, at intervals of two days, two injections of 0.75 gramme of atoxyl; then four injections of 0.50 gramme, separated by an interval of three days each. There are reasons for believing that on account of the accumulation these doses will suffice to maintain an efficacious proportion of the drug in the system.

If during the course of a series there arise premonitory symptoms of intolerance, such as abdominal or gastric pains, general malaise, or heaviness in the limbs, the treatment should be immediately interrupted, to be resumed again when the signs have disappeared.

Local Treatment.—In the ordinary treatment of syphilis by mercurial preparations it is a good rule to prescribe as well a specific which acts locally; on this principle I have used in all cases of ulcerated syphilids, including the initial chancre, local applications of cotton wool soaked in a one per cent. solution of atoxyl, or else an ointment of equal strength. I have not yet been able to decide as to the efficacy of this method of application of the drug; if it seems to be of no use I shall go back to the local treatment by sublimate, one to five thousand, or by ointments or plasters. In cases of gummata or of localized tertiary syphilids, injections of atoxyl in the vicinity of the lesions are clearly indicated.

Abortive Treatment.—In two of my cases, where the chancre was of recent date, I injected very near the lesion a portion of the dose administered. I cannot yet say what will be the result of this experiment. Metchnikoff and Salmon found that the disease went on with the evolution in the ape, in spite of postchancroid injections of atoxyl; but this was no longer the case when the injection was made *before* the chancre appeared. These two authors have studied this point on experimental lines, and Metchnikoff has been good enough to give me the following notes on the question:

“Seven macacus apes are inoculated with the same syphilitic virus; then, during the incubation period, two of them receive injections of a certain dose of atoxyl. But, whereas the chancre

appears at the proper time in the five cases that were not treated, the two treated apes show no visible sign of syphilis.

"It is therefore possible, with the use of arsenic, to prevent the development of inoculation syphilis, to abort it. In addition to its *curative* action on syphilitic lesions that have developed, arsenic has consequently *preventive* properties."

GENERAL PLAN OF TREATMENT

1. Should the series of injections be repeated? This question can be answered without hesitation in the affirmative. A single series is not sufficient; both Salmon and myself have seen fresh manifestations crop up in patients who had previously been freed of all symptoms by a first treatment. Salmon begins a second series two weeks after the termination of the first. It would be advisable to make repeated examinations of the urine, in order to ascertain the moment at which the drug ceases to be eliminated. Salmon found no more traces of it after two weeks.

2. How many times should a series of injections be renewed? Will the system continue to tolerate them? Is there not danger of producing chronic arseniasis; or, on the contrary, may we not hope, in analogy with what takes place with arsenic-eaters, that immunity against further intoxication will be obtained? These are questions that for the moment can only be raised; at the stage at which the subject now stands, no answer to them can possibly be given.

3. Should the atoxyl treatment be an exclusive one? I do not think so. Up to the present time, in order to be in a position to form an opinion on this new remedy I have systematically refrained from any concomitant mercurial treatment; but now that its value can no longer be questioned, my advice is to prescribe at the same time the mercurial and iodide treatment after the manner I have suggested, that is to say, during four years, successive periods of two months of mercury and one of iodide, unless the combination with atoxyl should prove more efficacious, which will not be easy to demonstrate on account of the property of prolonged latency inherent in the *treponema pallidum*. This parasite is a dangerous enemy, and we cannot be provided with too many weapons against it. There is no more incompatibility between

mercury and atoxyl than between mercury and iodide. These three specifics against syphilis can be administered simultaneously or successively.

Salmon has introduced a great step forward in the therapeutics of syphilis, one that can quite fairly be placed by the side of the extension of the importance of the disease in clinical medicine, the advance in its pathological physiology, its experimental inoculation, and the discovery of its pathogenic microbe.

The conclusions to be drawn from this paper are the following:

1. The results in 120 cases show that iodine anilarsinate, or atoxyl, has, as Salmon has demonstrated, a powerful effect on the infectious agent of syphilis.

2. We now possess against this disease a third specific agent equal, if not superior, to its predecessors.

3. Forms of associated, secondary infection, such as those that give rise to vegetating condylomata and some kinds of supuration, appear to be refractory to it.

4. This is equally true of syphilitic deuteropathic manifestations. This I found to be the case for the tongue, and for hemiplegia, and it is safe to prophesy that the same will be the case for tabes and general paralysis.

5. It would very likely be possible to cure syphilis, in the same way as sleeping sickness appears to be cured, by means of iodine anilarsinate injections, if they could be given for a sufficient length of time in suitable doses.

6. Unfortunately this is not the case, and the treatment is brought to a halt after a certain number of injections by symptoms of intolerance.

7. These symptoms consist of gastro-intestinal pain, nausea, vomiting, general malaise, disagreeable sensations in the limbs, dysuria, and, in the more severe cases, by fainting fits and algidity. Though these accidents are usually harmless and temporary, they are capable in a few cases of being quite alarming.

8. These accidents can be avoided by limiting the injections to a small number, by giving only large doses at the first two, by making the others at longer intervals and by stopping at the first appearance of abnormal sensations.

9. Aged people, those of small stature, and those with chronic

organic disorders, are predisposed to these accidents, and should be treated with smaller doses.

10. Doses administered in succession accumulate in the system. The consequence of this is that the patient can be kept under the influence of the drug with doses smaller than those of the first injection.

11. It is very likely that the sodium anilarsinate introduced into the system decomposes at the end of a certain time into toxic products; there is no other way of explaining the often sudden beginning, without premonition, of the signs of intolerance. The rapidity and greater or less extent of this decomposition account for the differences in the way the patients tolerate the drug. It would be desirable to find some more stable preparation.

12. The drug is eliminated fairly quickly; no trace of it remains in the urine at the end of two weeks after the last injection. Salmon thinks that a new series can then be safely commenced. Further experience will show the extent to which these series can be repeated without producing signs of chronic arsenical poisoning, and whether they will confer a condition of immunity similar to that enjoyed by arsenic-eaters.

13. There can be no question that in the production of these accidents the element arsenic preponderates over the element anilin.

14. It was necessary to carry out the first tests to demonstrate the microbicidal power of the anilarsinate, apart from all other treatment, general or local; but for the future both mercury and iodide should be administered at the same time as the atoxyl.

15. The direct local action of sodium anilarsinate has not yet been proved; still, it is advisable to make injections in the vicinity of the chancre, on the one hand, and on the other, of gummata, exotoses, and ulcerated tertiary syphilides.

16. Sodium anilarsinate given after infective coitus is able, in the ape at least, to abort the disease,—according to the experiments of Metchnikoff and Salmon.

TWO YEARS' EXPERIENCE OF TREATMENT BY THE INOCULATION OF BACTERIAL VACCINES

BY EDWARD TURTON, M.D., B.Sc., M.R.C.P.

Physician to the Hull Royal Infirmary

As every new therapeutic method must be judged solely by the results obtained in the treatment of large series of cases, and as no single observer can accumulate a sufficiently large number for this purpose, I add the record of my results to those already published.

The series is of interest not so much on account of numbers, but from the great variety of affections treated and the different vaccines used. I have attempted to give a critical and impartial survey of 73 cases submitted to vaccine treatment, during a period of over two years. Limitations of space prevent the detailed record of every case but some which present points of particular interest have been given more fully.

As long ago as October, 1906, I published¹ together with Dr. A. Parkin, a series of 34 cases of infections due to various bacteria treated by vaccines, and more recently,² in November, 1907, the result of 17 cases of pulmonary tuberculosis treated by tuberculin,—these cases with their further history are included in the present series.

NATURE OF THE VACCINES USED

The material used for injection in the tuberculous cases has consisted of tuberculin of three varieties. The greater part has been Koch's new tuberculin, T.R., obtained from Meister, Lucius and Brüning of Höchst am Main. As some confusion appears to have arisen as to the exact strength of this preparation, it has recently been authoritatively stated by Ruppel,³ that the strength of the substance sent out by the makers, may be expressed either as 1 c.c., being the extract of 10 mg. of dry bacilli, or that 1 c.c. contains 2 mg. of dry extracted substance in solution. For purposes of inoculation Koch's T.R. has been diluted with 0.5 per cent. pure phenol, so that each c.c. contains 1/500 mg. of the dry substance in solution. This diluted material does not keep well and so should be freshly

prepared at intervals of not longer than ten days. Sterilization at 60°C . for 30 minutes is advisable before use. It is convenient to keep the injection fluid in bottles with thick india rubber caps; the required dose being removed by piercing the cap with the needle of the injecting syringe. More recently I have used Nathan Raw's tuberculin, which is prepared ⁴ by a process similar to Koch's T.R., but from strains of bacilli of bovine origin. In some cases this tuberculin has appeared to do good when the results from Koch's tuberculin had been unsatisfactory. At the present time I am also using the newer and more complex substance introduced by Koch in 1901, called "New Tuberculin Bacterial Emulsion." It consists of pulverized bacilli in normal salt solution, with the addition of an equal volume of glycerin, each c.c. contains 5 mg. of ground-up bacilli. I believe it to be a very active form of tubercle products, and the same dose has been used as of Koch's T.R. Bandelier and Roepke report 205 cases treated with this product, but my experience has been too limited for me to be in a position to draw any conclusions as to its relative efficiency.

The other vaccines which I have used have been prepared as far as possible, from fresh cultures of the organisms according to the method now well known and described by Wright. Every vaccine has been standardized by the method of enumeration against red blood corpuscles ⁵ and the basis of the vaccine is a 0.5 per cent. solution of pure phenol.

DOSAGE AND INTERVAL OF ADMINISTRATION OF VACCINES

In the case of tuberculous infections, the dose of tuberculin administered to adults has varied from 1/5000 mg. to 1/500 mg. of solid substance. The average dose has been about 1/1000 mg., and in no case has a larger dose than 1/250 mg. been given and this but rarely. In children the dose has been smaller, according to the body weight. With regard to frequency of administration, chronic cases, involving bones, skin, joints, etc., do well if a dose of about 1/1000 mg. is given every 12 to 20 days according to chronicity, whilst acute cases, I find, do better on a smaller dose of about 1/2000 mg. repeated in from 7 to 12 days or so. When using the opsonic index as a guide to treatment, I have given injections of 1/2500 mg. at intervals of 4 to 7 days with marked benefit.

With regard to the dosage of other organisms, my present practice, where estimation of the opsonic index is impossible, is to give the following doses founded on experience gained when using the opsonic index, as a guide to treatment in all cases: *Staphylococcus pyogenes*, 200 to 1000 millions; *Streptococcus pyogenes*, 50 to 250 millions; *Pneumococcus*, 50 to 250 millions, *Diplococcus intracellularis*, 10 to 100 millions; *Bacillus coli communis*, 50 to 500 millions. The dose and frequency of administration vary in each case. Roughly speaking, the acute cases must have the smaller dose injected every 5 to 10 days, whilst chronic cases do well if the larger doses are injected at intervals of 12 to 21 days.

The researches of Muir and Martin⁶ and of Bulloch and Western⁷ have shown that opsonins are specific for each pathogenic organism and thus on experimental grounds the necessity for the injection of each case with a vaccine made of the particular morphological variety of organism producing the disease. Not only is this true, but at an early stage of clinical experience of this treatment, I arrived at the conclusion that the greatest success in vaccine treatment was to be attained by the cultural separation of the exact strain of organism peculiar to the patient and by the preparation and injection of a vaccine prepared from that organism. This course has been adopted in nearly all my cases and I regard it as one of the essentials to success. Obviously this plan of procedure entails a great amount of work as well as sound bacteriological knowledge. The method is, however, inapplicable to tuberculous infections, and the tuberculin as supplied by the manufacturers has to be used indiscriminately for multitudinous affections possibly caused by varying strains of tubercle bacilli. Many cases in which there was a mixed infection have required injections of more than one variety of vaccine. When the tubercle bacillus, for example, has been associated with staphylococci, streptococci, pneumococci, etc., vaccines of both organisms have been used and the opsonic index determined for both organisms. In some cases improvement has been more rapid after a double vaccine was used.

It is obvious that treatment by vaccines can supplement but cannot entirely replace ordinary medical and surgical treatment; advantage must be taken of every means for doing good to our

patients, which skill and experience can suggest. By raising the opsonic index we put the patient in a position to gain mastery over his disease, but fresh air, properly regulated rest and exercise, good food, regular habits and due attention to the excretions, help him to do this and we must avail ourselves of their help wherever possible. This applies to the general health; much can also be done locally, for operative removal of diseased parts must be done whenever necessary. Pus must be evacuated wherever an accumulation exists, for it not only acts injuriously by its toxins but by pressure closes the lymph-channels and prevents the opsonins reaching the diseased parts. In addition, it has been shown that the fluid contents of an abscess are almost denuded of opsonic elements and opening the abscess not only rids the body of toxic material but permits a fresh supply of available opsonin to reach the organisms. In some cases it proves of advantage for the same reasons to produce local erythema by such artificial means as counterirritation, fomenting, or by Bier's method of passive congestion. Such proceedings have proved of benefit in some of my cases.

THE NECESSITY FOR OPSONIC ESTIMATIONS IN VACCINE TREATMENT

The question naturally arises as to the absolute necessity of carrying out estimations of the opsonic index in every case under treatment. The method of Wright and Douglas is a very delicate and difficult one requiring a certain amount of manipulative skill and bacteriological knowledge, but only those who have made thousands of opsonic estimations can realize the enormous amount of time and energy to be expended before the opsonic index can be entered on the chart. When this has to be done scores of times in each case, both eyesight and temper suffer under the strain, and if the treatment of any number of cases is undertaken, together with ordinary hospital and private work, personal estimation of the opsonic index becomes a physical impossibility.

With my earlier cases, I estimated the opsonic index every day or every few days before treatment, then I gave injections, at first very small in amount, and watching their effect, regulated the administration of the vaccine, as to dose and frequency, as seemed

necessary to produce the maximum effect on a minimum dose of vaccine.

After eighteen months of this method, I asked myself if some general principle could not be discovered which would save all this work. As the result of analysis of my cases, the next plan was to work out the index very frequently at first, and by regulating the dose of vaccine try and find the minimum dose necessary to maintain the index above normal for a good length of time. This dose was then given at what seemed the best intervals, with occasional estimations of the opsonic index to assure oneself that it was being maintained at a satisfactory level. Such a routine I did not regard as an ideal one, but the best that could be worked with many demands on professional time. Experience of a large number of cases showed that it was possible by such a scheme to so space the injections, as to produce as good results as previously, with much less expenditure of time.

The step which naturally followed was to inject at stated intervals without estimating the opsonic index at all. After having treated a large number of cases on this plan, I am of opinion that quite as good results can be obtained by so doing, provided that the doses and interval of administration are those which opsonic estimations showed to be correct according to experience previously gained. I am therefore now inclined, not to insist on estimations of the opsonic index as a routine plan, because the enormous labor and expenditure of time is not repaid by correspondingly good results. Although this is the plan carried out in treating tubercular and staphylococcic affections, I still estimate the opsonic index for scientific reasons in infections with which I am not so familiar.

It is I believe generally thought that no case should be injected, if on a single occasion the opsonic index should be found above normal, but many of the cases I have treated have had indices above the normal and apparently these have done equally as well as those in which the index was persistently below normal. As a matter of fact, it is only in the acute and active cases that the opsonic index is likely to be high and if these cases are examined often enough they will not be found to remain constantly high for long periods, but will show "high phases" and "low phases" corresponding to waves of auto-immunization. I have always maintained the useless-

ness of single readings of the opsonic index as guides to the patient's condition. Refusing to treat a patient whose opsonic index on a single occasion is found above normal, is to cut off from treatment many cases which might benefit; for a high index shows that the patient's immunizing apparatus is not yet exhausted, as may possibly be the case when a persistently low index is found.

In addition to this my observations have shown that the height of the opsonic index is not always an exact indication of the clinical condition of the patient. It is sometimes possible for him to be going rapidly down hill with his opsonic index above the normal line on the occasions on which it has been examined. Also it is practically impossible in actual practice to produce any great summation of positive phases so as to produce an index of say three or four times the normal, and though I have no actual proof, in all probability any great summation of negative phases is not a practical possibility. Another element which diminishes the usefulness and value of opsonic estimations is, that very great and rapid changes take place in opsonic power as the result of rest, exercise, menstruation, digestion, etc., which interfere with the conclusions to be drawn unless the estimations are performed at intervals so frequent as to be impossible in practice. There are of course other and very important factors in addition to the phagocytic power of the blood serum, concerned in recovery from bacterial infection.

a. CASES OF INFECTION BY THE TUBERCLE BACILLUS

1. *Tuberculous Disease of Lungs and Pleuræ*.—Since January, 1906, I have had under treatment 26 cases in which the lungs or pleuræ were affected by the tubercle bacillus. In addition to these cases, two or three patients have been treated for less than one month or have had only two injections, these cases I think are rightly excluded from the series. In 19 of the cases the opsonic index was used as a guide to treatment.

For several reasons this series of cases appears to have a special value and interest. In the first place there are cases of all degrees of severity, comprising cases 4, 13, 20, 22, 23, and 25, at an early stage in which the disease was not far advanced and constitutional disturbance slight; old chronic cases, 6, 14, and 19; and cases 3,

8, 11, 12, 16, 18 and 24, in which the disease was far advanced, constitutional disturbance great and in some instances the condition desperate.

In addition, all the cases, with five exceptions, have been treated out of hospital, where the control of diet, rest, exercise, fresh air, etc., was naturally more difficult than in the case of patients in sanatoria. The results represent what may be accomplished by practitioners who wish to carry out tuberculin treatment. In some cases (3, 10, 16), however, the unsatisfactory home conditions have greatly militated against success, and the impossibility of securing proper hygienic and dietetic conditions led to the abandonment of the treatment at an early stage. Although treatment has been carried on out of hospital, advantage has been taken whenever possible of any remedial aids which experience could suggest, such as the proper ordering of rest and exercise, such fresh air as could be obtained in the house, back garden, or by temporary residence in the country or at the sea-side. Cod-liver oil, occasional tonics and the treatment appropriate to such complications as hæmoptysis, were the only other remedies used. Almost all the patients have been able or compelled, to carry on their usual occupations, in some cases very trying ones, during the whole or greater part of treatment.

In judging of the value of tuberculin injections in this disease, the above facts must be borne in mind, for they have undoubtedly added to the difficulty of producing good results or have seriously retarded progress in my cases. At the same time the fact of being able to carry on the treatment with the patient at home or at work, increases its usefulness, for in many of my cases the necessity of earning the daily bread has been a pressing question. On the other hand I do not think that any but the mildest cases of phthisis are suitable for treatment in ordinary hospitals, because the length of time we can keep them in such hospitals is too short for them to derive any permanent benefit. If, however, in early cases hospital treatment for a couple of months can be followed by open air life in the country or at the sea-side, then I think we may do good. Unfortunately when this cannot be done most hospital cases soon relapse.

The clinical results of tuberculin in the successful cases, have

been great improvement in the general health, a gradual fall of the evening temperature, a return of the appetite, and an increase in the weight. An increase in the number of red blood corpuscles and of the percentage of hæmoglobin is generally an early result, and a pale, anæmic complexion is replaced by a good healthy color. The cough gradually becomes less troublesome and the sputum reduced in quantity. In some cases in which the sputum is examined often, the tubercle bacilli can be found to become fewer and finally none may be found. The physical signs of active disease become less marked and in cases in which the lung destruction has been great, are replaced by signs of fibroid change. In some of the slighter cases all abnormal physical signs in the lung disappear. Where the patient is doing well a gradual fall of the evening temperature is one of the most striking features and I have observed in some that the evening temperature has fallen a degree or so during several days immediately following an injection, to rise again slowly as the next injection became due, after which a further fall has taken place. This is seen only in some cases, and the fall of temperature is quite independent of the opsonic index. The temperature is not a trustworthy guide to treatment.

Result of the Treatment in Cases of Pulmonary Tuberculosis.

—It is obviously impossible to give detailed accounts of all the cases, and although I recognize that no classification according to results can be entirely satisfactory, I think it best to divide my cases into five classes as follows:

Class 1.—Cases in which the disease has apparently been arrested or in which there have been no abnormal physical signs detected or any symptoms present for six months:

Six of my cases can be placed in this class. In case 2, there have been no symptoms for 21 months, in case 4 for 22 months, in case 5 for 18 months, in case 6 for 14 months, in case 13 for 8 months, and in case 15 for 6 months. Not one of these cases showed signs of very advanced disease, great lung destruction or severe constitutional disturbance, and cases of this type are those which almost invariably do well under treatment. It is interesting to note that the gain in weight in these cases during treatment was 19 lbs., 13 lbs., 17½ lbs., 3 lbs., 12½ lbs., and 14 lbs. respectively. Typical cases of this class are the following:

CASE 2.—Female, aged 39 years, came under treatment with a history of failing health, loss of weight, cough, and expectoration for six months. She was confined to bed, and there were evening rises of temperature and night sweats. Tubercle bacilli were present in the sputum. There were physical signs of consolidation at the apices of the uppermost and basal lobes on the right side and some deposit at the same base behind. The tuberculous opsonic index was 0.75. In 14 weeks ten injections of Koch's T.R. were given and 22 opsonic estimations made. The cough and expectoration entirely disappeared, she gained 19 lbs. in weight and all abnormal physical signs in the chest cleared up. It is now 21 months since the last injection was given, and the patient has been going about her ordinary life. When last seen she was perfectly well, the weight fully maintained and all symptoms and physical signs of disease absent. There was a bad family history and this patient's sister, Case 18, who came for treatment when in a desperate state, died during the time she was receiving injections of tuberculin.

CASE 5.—A male, aged 44 years, gave a history of cough and occasional blood-stained sputum for six months, with a loss of 9 lbs. in weight. On two occasions there had been severe hæmoptysis. The physical signs were those of consolidation at the apices of the upper and lower lobes on the left side, and in a less degree at the uppermost lobe on the right side. Tubercle bacilli were found in the sputum. The opsonic index before treatment on two separate occasions was 0.82 and 0.62. During 8 months there were 22 opsonic estimations and 18 injections of Koch's T.R. The patient increased $17\frac{1}{2}$ lbs. in weight, the cough practically disappeared and the physical signs of active disease were no longer present. No tubercle bacilli have been found in an occasional very small quantity of frothy sputum. The patient is now in better health than he has been for years, his weight is maintained, and signs of active disease in the lung are negative, although he has been at work in a stuffy office. The opsonic index when last estimated was found to be 1.06.

Class 2.—Cases greatly improved and where arrest of the disease may be hoped for but in which some physical signs and

symptoms of disease are still found or where six months have not yet elapsed since such have been absent:

In this class I can place six cases, in two of which the disease was far advanced, with considerable loss of weight and constitutional disturbance, one was a case in which a deposit at both apices was associated with a large pleural effusion; the remaining cases were fairly advanced. During treatment these patients increased in weight by the following amounts: 35½ lbs., 13 lbs., 17 lbs., 7 lbs., in a child 12 years of age, 23 lbs., and 38 lbs. respectively. The following cases are typical of this class:

CASE 8.—A male, aged 30 years, gave a history of rapidly progressing disease for over four months. He was desperately ill, with evening temperature over 104°F., and sweating was profuse. He had a racking cough and had lost over 14 lbs. in weight. He was so ill that on arriving in Hull, he was in a state of collapse. There were signs of disease of practically the whole of both lobes of the left lung, breaking down at the apex of the upper lobe and consolidation and pleurisy at the base. A few râles were to be heard over the right apex behind. The heart's impulse was well outside the nipple line, the pulse over 120 per min.; he was cyanosed and breathless on the least movement. He was hoarse and there was oedema at the base of the arytenoids. Tubercle bacilli were found in the sputum. The opsonic index before treatment was, on three occasions, 1.33, 0.62 and 1.23. After 12 weeks' treatment in a nursing home he was much improved, the cough and sputum were less, the evening temperature did not rise above 99°F., the cardiac embarrassment and pulse rate were less. Improvement in physical signs was marked. He was sent to the sea-side and the treatment was continued for 5 months. The improvement was wonderful and continued without further injections for another 4 months, when he sailed for Australia to work on a sheep farm. I saw him six months after the last injection when he was hardly recognizable as the wreck who had come under treatment 12 months before. He had occasional cough and at times a little sputum early in the morning but the evening temperature was normal and he had gained 2 stones 7½ pounds. The physical signs showed no active disease in the lungs, whilst on the left side a fibroid change seemed to have taken place. I have just received

a letter from the patient in Queensland, saying that he is working and feeling almost well again.

CASE 25.—A male, aged 22 years, came under treatment with a history of loss of weight and appetite, and with a troublesome cough of two months' duration. For a fortnight he had pain in the left side and great shortness of breath. He was very anæmic and had evening rises of temperature and night sweats. The sputum did not contain tubercle bacilli, but Calmette's ophthalmoreaction was positive. There were signs of slight consolidation at the left apex and at the right uppermost lobe. A large pleural effusion was present at the left base, from which twenty-three ounces of clear yellow fluid were removed and 4 c.c. of adrenalin chloride solution injected. A cytological count of the centrifugalized deposit showed 85.5 per cent. of small lymphocytes. The patient was given six injections of T.R. of bovine origin and made excellent progress. There was a gain in weight of 23 lbs.; the cough, pain and shortness of breath disappeared, and with the exception of slight friction signs at the left base, physical signs of disease were negative. He has since returned to work apparently perfectly well.

Class 3.—Cases in which some improvement has taken place in the general health, with amelioration of the symptoms and signs, but in which the result of the treatment cannot be regarded as quite satisfactory:

Six cases can be placed in this class, in some of which it is felt that the improvement would have been marked if the patients' circumstances and work had been more satisfactory. Most of them were severe cases of long standing rapidly going down hill, with considerable lung destruction or there was some complication present which made complete recovery difficult. Some of them have only been under treatment a short time and more improvement can undoubtedly be expected. The gain in weight in these six cases has been respectively, 3 lbs., 3½ lbs., weight stationary, 5 lbs., 8 lbs., weight stationary. The following case may be taken as typical of this class:

CASE 11.—A female, aged 23 years, had commenced to show signs of failing health attended with cough and expectoration, five and a half years previously. Residence at the sea-side produced

marked improvement, and she remained well up to three years ago. At this time the glands on the side of the neck enlarged and the cough returned, and during the last five months the condition had gradually become worse and when seen it was desperate. The weight was only 6 stones 3 lbs.; she was cyanosed and there was dyspnoea on the slightest exertion. Tubercle bacilli were found in the sputum. Evening temperature was 103°F. and the pulse over 100 per minute. The physical signs were those of a cavity at the left apex, with extensive deposits at both left lobes, and on the right side consolidation at the apex of the uppermost lobe and at the base. On both sides of the neck were masses of enlarged glands and lymphatic chains, and in both groins and abdomen. The opsonic index was 1.07. The patient has had 40 injections of all three varieties of tuberculin and 45 opsonic estimations have been made. Some improvement has taken place. The evening temperature is not often above 99°F., the dyspnoea is much less and she is able to walk about. There is very little cough or sputum, and the glands are greatly reduced in size. Though the weight has only increased 3½ lbs., the physical signs show that there is hardly any active disease on either side of the chest and the cavity at the left apex shows signs of fibroid contraction.

Class 4.—Cases in which little or no progress has been made:

Three cases must be placed in this class, one of which has not yet been very long under treatment; the other two cases ought not to have been treated by tuberculin injections, as the home surroundings were most unsatisfactory and the disease was extensive and general health rapidly failing. Case 16 will serve to illustrate this class.

CASE 16.—A male, aged 19 years, a tall overgrown clerk, came to see me with a six months' history of rapidly failing health, cough and expectoration. He had evening rises of temperature, night sweats, hoarseness and loss of weight. Dyspnoea was severe, the pulse 120 per minute, and he vomited after food. Physical signs showed consolidation at both apices, that on the right more extensive. There was a cavity at the right apex and extensive deposit at the left base. The voice was reduced to a whisper and the epiglottis, left ventricular bands, and base of the arytenoids

were oedematous. Tubercle bacilli were present in the sputum. The opsonic index on three occasions before treatment was 1.06, 1.24, and 1.63. Before treatment was abandoned 23 injections of T.R. were given and 31 opsonic estimations made. During the first seven weeks he improved somewhat, the weight increased 7 lbs., the cough and sputum were less and the laryngeal condition improved. He then had three severe attacks of hæmoptysis and became decidedly worse. He rapidly lost 11 pounds in weight, the disease began to progress rapidly, the dyspnœa and vomiting were at times severe. When last seen two months after treatment ceased he was going down hill quickly and in a hopeless condition.

Class 5.—Cases in which death occurred during treatment or after it had been abandoned:

This class contains five cases, in three of which death took place whilst the cases were under treatment, in the other two treatment had been given up some time before, when it was seen that death was inevitable. As in the previous class these cases were all practically hopeless from the first, and with my present knowledge of the limitations of the treatment they would be refused injection. The deaths resulted from the fact that treatment was commenced in hopeless cases to see if something could not be done as a last resort to save them, in two of the cases it was abandoned at an early stage. All were most severe and advanced, or had some complication, such as renal disease, which practically made recovery impossible. Cases 3 and 12 will serve as examples of this class.

CASE 3.—A female, aged 16 years, came under treatment with a history of steadily advancing disease for four years. Brief sanatorium treatment did no good and she was in a desperate condition. The cough was constant with large quantities of purulent sputum loaded with tubercle bacilli. The evening temperature reached 102.5°F. with copious night sweats. Vomiting took place after almost all food, and diarrhœa was troublesome. There was a large cavity at the left apex and the whole of the left lung was diseased. There were signs of deposits at the apex of the right uppermost lobe and of pleurisy at the base. Considerable cardiac displacement and rapid pulse were present. The tuberculous opsonic index was 0.85 and two days later 1.04. Treatment was carried out for 10 weeks, during which seven injections of T. R. were used and

ten opsonic estimations made. The patient at first seemed to derive some benefit from treatment and put on four pounds in weight but an empyema formed for which operative measures were refused and treatment was then discontinued. The home surroundings were also unsatisfactory. The patient died ten months after the last injection was given.

CASE 12.—A male, aged 30 years, had over $3\frac{1}{2}$ years' history of pulmonary affection. He had resided for two long periods in South Africa and two months in a sanatorium. When seen, there were troublesome cough, with sputum containing tubercle bacilli, evening rise of temperature, night sweats, poor appetite and frequent attacks of dyspepsia and vomiting. The physical signs were those of extensive consolidation at the apices of both lobes on the right side, with a cavity at the apex of the uppermost lobe. On the left side there were deposits at the apices of both lobes. He was very hoarse, and the left vocal cord and arytenoid were oedematous and ulcerated. The opsonic index on two occasions was found to be 1.54, and ten days later 0.84. The patient was given 34 injections of tuberculin and 40 opsonic estimations were made. At first there seemed to be some improvement, with slight gain in weight and less cough, but this did not last long and the condition gradually became worse. Treatment was somewhat intermittent but death took place about 12 months after the first injection had been given.

2. *Tuberculous Disease of Lymphatic Glands.*—I have had under treatment ten patients with tuberculous glands, in three of whom the disease was associated with pulmonary tuberculosis. In one of these three cases (Case 4) there was a caseous gland, with a sinus on the right side of the neck with affection of the right apex of the lung. The opsonic index before treatment was 0.82, and after five injections the gland disappeared, the sinus healed and no abnormal physical signs could be detected in the lung. The patient put on 13 lbs. in weight and after 22 months remains perfectly well. In Case 21, there was an acute tuberculous pneumonic condition, with masses of glands in the neck. After 10 injections the glands had practically disappeared, together with the signs of disease in the lung, when the patient was last seen. In the other case (Case 11), in which the treatment of the lung condition has

not been very successful, the glands are greatly reduced in size. Of the other seven cases, one patient (Case 27) had several chronic sinuses on the left side of the neck, with glandular enlargement and extensive affection of the skin and subcutaneous tissue, of several years' standing. After four months' treatment the sinuses had all closed, the infiltration had disappeared and the patient's general health much improved. In another case (Case 33), glands on both sides of the neck have completely disappeared after four months' treatment. Two of the remaining five cases had been pronounced inoperable after several unsuccessful operations had been performed.

CASE 29.—A child, aged 6 years, had large masses of glands on both sides of the neck. Several of the glands which were fluctuating were simply incised during treatment. Seven injections of Koch's T.R. were given and after 13 weeks the glands had disappeared and wounds healed. A year afterwards the child was seen with some moderately enlarged glands but these subsided after a few injections. After nine months the child has again been seen with advanced tuberculous disease of the ankle. One must naturally ask, would more lengthy treatment at first, have prevented these relapses?

CASE 30.—A female, aged 43, who had had two extensive operations involving partial removal of the right pectoral muscles, presented herself with a number of enlarged glands on both sides of the neck and in both axillæ. In the abdomen a large mass of glands was to be felt in front of the spine and the spleen was enlarged. The right arm down to the fingers was œdematous and there were physical signs of glands at the roots of both lungs. The opsonic index was 0.95. She was under treatment and observation 18 months and had 37 injections of Koch's T.R. Several glands which were caseating had to be removed during treatment. There are now no enlarged glands to be felt anywhere; the spleen is no longer palpable but there is still some œdema of the arm and forearm. The patient has put on 16 lbs. in weight and feels in such excellent health that quite recently she asked if she might marry.

In two of the remaining cases there was complete disappearance of the glands although in both it was necessary to incise fluctuating glands. The last case (Case 28) was under treatment only a short

time and had seven injections; she made some improvement but not being satisfied, discontinued the injections. Though I cannot claim the great success in these cases reported by Sir A. E. Wright, undoubtedly most of them have been greatly improved. The great difficulty arises from the fact that in so many of the cases when first seen, caseation or liquefaction of the caseous masses has already taken place. In these circumstances incision is demanded and seems all that is necessary, for subsequent progress is usually rapid. Case 30 suggests the advantage of this treatment for tuberculous mediastinal and abdominal glands, otherwise inaccessible.

3. *Tuberculous Disease of Kidneys*.—Four cases of renal tuberculosis have come under my care; of these one died under treatment and the other three were greatly improved. The fatal case (Case 34) was a male, aged 15 years, who came with a history of wasting, pain and pyuria lasting over three years. The right kidney was enlarged and tender, and the urine contained pus and tubercle bacilli. The opsonic index was 1.3 and 1.4 before injection. Treatment lasted 24 weeks, during which 15 injections of T.R. were given. Pus disappeared from the urine and the number of tubercle bacilli decreased until they were very hard to find and the general health greatly improved. During the last four weeks, he had an attack of influenza and the symptoms became worse. Eventually he died of uræmia. No postmortem could be obtained. It is of interest to notice that throughout the duration of treatment the opsonic index was never found below normal.

Of the remaining cases, two had had nephrotomy performed with a view to the removal of the kidney, but in both instances it was found impossible to remove the organ, and simple drainage was all that could be done. In both cases the improvement under the injections was remarkable.

CASE 35.—A female, aged 21 years, increased 11 pounds in weight, the sinus closed and pus and tubercle bacilli disappeared from the urine after 14 injections. She remained well for 16 months, when a slight amount of pus and a few tubercle bacilli were again found in the urine. After a few injections the condition again cleared up. As there was a secondary infection with *Staphylococcus pyogenes albus*, a vaccine of this organism was injected and subsequent progress was more rapid.

The other patient, Case 36, was in a desperate condition when treatment commenced and his progress was remarkable. He gained 20 lbs. in weight, and after 15 injections the sinus closed and pus and tubercle bacilli were no longer to be found in the urine. He is in excellent health 12 months after the last injection.

CASE 37.—A female, aged 39 years, had a history of loss of weight, lumbar pain, frequency of micturition, pyuria and tubercle bacilli in the urine. The right kidney was enlarged and tender. After 13 injections of T.R. she had increased 34 lbs. in weight, the micturition was no longer too frequent, the right kidney was no longer palpable, and tubercle bacilli and pus are not to be found in the urine. The patient is now free from symptoms and quite well.

There is no doubt that in three of these cases very great benefit has been derived from vaccine treatment, for in two patients the resources of surgery were exhausted; unfortunately in Case 34, a relapse took place but this was due, I think, to the injections having been discontinued at too early a date.

4. *Tuberculous Disease of Bones and Joints.*—These cases being essentially surgical, only five have been under my care. In one of the cases the elbow-joint was affected, in the other four the spinal vertebrae were the seat of the disease. In Case 38, the patient, a male, aged 22 years, had had partial erosion of the right elbow-joint two and half years previously. A month before I saw him, an abscess had formed in the joint which had been scraped, leaving an unhealed sinus and thickening round the joint. After 12 injections the sinus completely healed, the thickening disappeared, and there has been no more trouble for 21 months.

CASE 40.—A male, aged 46, had lumbar caries of 18 months' duration, three operations had been performed, leaving sinuses in the back, right loin and iliac region. His condition was most unsatisfactory. The tuberculous opsonic index was 0.71 and that for the *Staphylococcus pyogenes albus*, which caused a secondary infection was 1.15. Injections of a staphylococcic vaccine, as well as of T.R. have been given, with marked benefit to the general health and local condition during the last 18 months. He has gained nearly 2 stones in weight and for over a year has been at work. Two of

the sinuses are healed and there is only a slight thin discharge from the other.

CASE 39, of old spinal caries, was only under treatment a short time but the sinus had not healed, although improvement in the general health had taken place.

CASE 41.—A male, aged 36 years, was in a hopeless condition of tuberculous disease of the left hip-joint and lumbar spine, dating from boyhood. There were 8 discharging sinuses and he had been an invalid for years. He was treated for over six months with T.R. and staphylococcic vaccines and certainly seemed to make a little improvement at first, putting on a few pounds in weight, but some time after treatment was suspended he died of lardaceous disease.

CASE 42.—A female, aged 18 years, was an early case of spinal disease. She was given tuberculin injections for 15 months, at the same time as absolute rest in bed. The result has been excellent. She is able to get about and active disease is apparently arrested. This shows the good which can be done in cases which come under observation at an early stage of the disease.

5. *Lupus of the Skin*.—My experience of the treatment of this condition has been limited to three cases, of which one was slight and two very advanced. Judging from the early recorded cases of tuberculin treatment in lupus, good results had been expected but in my two advanced cases I have been disappointed.

CASE 43.—A male, aged 10 years, had extensive lupus of the face and limbs, in all 34 patches, with partial destruction of one ear, for which all treatment had been useless. The opsonic index for the tubercle bacillus was 0.45 and for the staphylococcus aureus, present as a secondary infection, 0.65. Vaccines of both these organisms were given, during the past two years. For the first nine months good progress was made with the ulcerated patches on the face, which had almost healed, but during the last six months there has been a relapse and though better than at first, the condition is far from satisfactory. The patches on the limbs are in *statu quo*, but they are of the scaly variety and as shown by Western,⁷ particularly obstinate.

CASE 44.—A male, aged 10 years, had extensive lupus destroying almost the whole of the nose and right ear, with considerable

ulceration of the palate, upper lip and cheeks. There was a large patch 5 inches in diameter on the right thigh and on the left foot involving several toes. He has been under treatment 18 months and great progress has been made, all the patches are healing but the progress is very slow and disappointing.

The third case (Case 45) was a mild one in which there was a dry scaly patch about six inches in area on the side of the face. During four months there has been very great improvement and the prospect of complete cure seems good.

6. *Tuberculous Disease of Abdominal Organs.*—In this class I place two cases.

CASE 46.—A male, aged 27 years, had recurrent attacks of pain in the right iliac region, with pain and vomiting and the formation of a tumor the size of a goose's egg. The abdomen was opened and extensive tuberculous disease of the cæcum and ileum found. Removal was impossible. He was given 38 injections of T.R. and 21 injections of *Bacillus coli* vaccine, during 16 months. He gained 16 lbs. in weight, the tumor has entirely disappeared and he has been back at work for over a year. There are still very rare attacks of pain very mild in character, but the surgeons still refuse to interfere.

CASE 47.—A female, aged 22 years, had a typical attack of Addison's disease, of 9 months' duration. There were signs of tubercular disease in the lungs and a very large pleural effusion on the left side, which had to be evacuated twice. Her opsonic index before treatment was 1.14 and she was given 10 injections of tuberculin of all three varieties. The temperature was certainly reduced after the injections were commenced and the patient seemed a little improved but death eventually took place after three months' treatment. The diagnosis was confirmed post mortem.

b. INFECTIONS BY *BACILLUS COLI COMMUNIS*

The recorded cases of *Bacillus coli* infections treated by vaccines are so few, that a brief account of four cases which have come under my care seems justified.

CASE 48.—A male, aged 48 years, had been ill for three weeks with acute abdominal pain, sickness, rigors and loss of flesh. There was an epigastric tumor and the patient was operated on for a

suspected pancreatic disease. The pancreas was normal but two large gall-stones were removed from the gall-bladder. There was no improvement after operation, the rigors continued, and the patient appeared seriously septic, without actual pus formation or any sign of peritonitis. The condition was desperate and he was not expected to live. The gall-bladder secretion was examined and a pure culture of *Bacillus coli* obtained. No blood culture was made. The colon bacillus opsonic index was 0.93. He was given three injections of a vaccine of the organism and the improvement was remarkable. After the first injection he ceased having rigors and in four weeks he was perfectly well and has remained so. I am inclined to regard this condition as one of *Bacillus coli* septicæmia.

CASE 49.—A male, aged 28 years, had an attack of appendicitis, followed by abscess formation. He was operated upon on the fourth day and the abscess drained. A culture made from the pus showed *Bacillus coli* alone and a vaccine was made of it. The opsonic index 48 hours after operation was 0.8. Three days after operation the first injection was given, followed by four subsequent ones. The patient made a slow but excellent recovery which was undoubtedly assisted by, if not due entirely to the vaccine. CASE 50 was very similar to this and the recovery from an appendicular abscess took place after the patient was in a desperate condition.

CASE 51.—A male, aged 37 years, had suffered from cystitis for six months. Ordinary treatment by urinary antiseptics had not done much good. A catheter specimen of urine was taken, from which *Bacillus coli* was cultured. The opsonic index for this organism was 0.68. A vaccine was made from the culture and after eight injections, the cystitis was quite well, and no bacilli could be found in the urine. The patient has remained well since.

C. EPIDEMIC CEREBROSPINAL MENINGITIS

Two cases of acute cerebrospinal meningitis have received vaccine treatment. In each case the organism obtained from the cerebrospinal fluid had all the characteristics, morphological and cultural, of *Diplococcus intracellularis* of Weischelbaum and both patients were injected with a vaccine prepared from a culture of their own particular organism.

CASE 52.—A female, aged 16 months, had been ill ten days when the first injection was given and her condition was desperate. The child died two days later.

CASE 53.—A male, aged 8 years, had a typical attack of cerebrospinal meningitis, and was given two injections of vaccine in the 13th and 18th days of the disease. The opsonic index on the day previous to the first injection was 0.45, on the day of injection 1.09, the day following it was 1.71, and three days afterwards 1.37. On the day of the second injection it was 1.54. The child died 27 hours after the second injection. Each injection was of 100 millions of organisms. In neither case can it be asserted that the injections seemed to have any influence on the course of the disease, though it must be admitted that both patients, as shown by the post-mortem findings, were in a desperate condition.

d. INFECTIONS BY STREPTOCOCCUS PYOGENES

Five patients have been under treatment suffering from streptococcic infections. As a rule in these cases the course of the disease is a very rapid one and it appears necessary to inject at as early a date as possible and to repeat the injections at very frequent intervals, of from two to five days, if any benefit is to be derived.

CASE 54.—A male, aged 28 years, was seen two days after a scratch on the hand with a dirty wire. There was oedema and redness of the hand and forearm, great prostration, with a temperature of 102°F. A number of incisions were made into the oedematous area, and from the exuded serum a culture of *Streptococcus pyogenes* was obtained. A vaccine was made from this culture and injections were given on the 3rd, 5th, 8th, and 12th days after infection. The patient made an excellent recovery and the incisions soon healed.

CASE 55.—A male, aged 54 years, showed signs of infection 24 hours after a finger prick during operation on a septic case. Free incisions were made and from the pus, as well as from the blood, a pure culture of streptococci was obtained. Four injections of vaccine were given on the 4th, 6th, 9th, and 11th days respectively. The opsonic index at the time of the first injection was 0.81, eleven hours later it was 1.95, 24 hours after 1.71. At the end of 48 hours the index had fallen to 1.4 and the second injection was given,

the index rising in 24 hours to 1.68. After the 3rd injection an index of 1.84 was recorded. The patient made an excellent recovery from the streptococcic infection, but unfortunately took a chill during convalescence and died two months later of empyema.

CASE 56.—A patient, aged 23 years, had puerperal septicaemia due to streptococcic infection. She was given two injections of a vaccine made from the organism cultivated from the blood, on the 9th and 11th days after parturition. The case seemed hopeless from the first and the patient died on the 13th day, having apparently derived no benefit from the injections.

Two patients (Cases 57 and 58) both with chronic streptococcic infection of the antrum, frontal sinus and ethmoidal cells, were given several injections of a vaccine prepared from the organism separated from the pus (in one of the cases with the addition of staphylococcic vaccine) and although both have recovered after many months and several operations, it is not possible to say that they derived much benefit from the injections. In each case the opsonic index for the organism was raised and it may be that the blood though rich in opsonins was unable to obtain free access to the diseased bony areas.

e. INFECTIONS BY STAPHYLOCOCCUS PYOGENES AUREUS AND ALBUS

Fifteen cases due to staphylococcic infection have been under treatment, in addition to those cases where the staphylococcus was present as a secondary infection.

1. *Acne Vulgaris*.—Eight cases of acne have been treated and at the outset I may say that my experience of the treatment of this condition is not so entirely favorable as that reported by Wright, Western and others. All the cases certainly seemed to improve at first but the tendency to relapse when the injections are discontinued is very great. As a rule, it is true that a few injections again prove effective but the necessity for their repetition is unfortunate. The infecting organism was isolated in six of the cases and the *Staphylococcus aureus* and *albus* were found in an equal number of cases. In nearly all the cases it was found necessary to prepare a vaccine from a culture of the particular strain of organism infect-

ing the patient, although the necessity for this does not seem so great as it is in affections due to streptococci, *Bacillus coli*, etc.

In three of the eight cases the pustules rapidly disappeared under treatment and the patients have remained quite clear of pustules without relapse, for several months after the injections were discontinued. Of the other five cases all were improved by staphylococcic injections; three, however, have relapsed, after being clear of pustules for a varying length of time, but have improved again after more injections. Of the other two cases, one improved but discontinued injection treatment when a relapse occurred, whilst the last patient with a very severe pustular and indurated acne of the face, neck, chest and back, of 15 years' duration, showed considerable improvement for some time, but even with injections continued for over 12 months, it was found impossible to keep the face entirely clear of pustules. The patient ultimately abandoned the treatment.

2. *Staphylococcic Septicæmia and Pyæmia*.—Two cases of puerperal septicæmia in which the infecting organism was *Staphylococcus albus* have come under treatment.

CASE 67.—The patient, aged 37 years, was seen a week after parturition, when she had had a temperature reaching as high as 102°F. at night, for five days. *Staphylococcus albus* was obtained in pure culture from a swab introduced into the uterus and a vaccine was made from this. The opsonic index was 0.82. Only two injections were given at an interval of 48 hours. There was very marked improvement and 24 hours after the second injection the temperature dropped to normal and the patient made an uninterrupted recovery.

CASE 68.—A patient, aged 22 years, was seen 14 days after a miscarriage, when she had been ill for ten days. A week before some blood clot had been cleared out of the uterus. The temperature was above 104°F., the pulse 130 per minute and the condition altogether desperate. *Staphylococcus albus* was cultivated from the blood and a vaccine made, with which the patient was injected at intervals of from two to four days. The opsonic index before injection was 0.64 and five injections were given. She certainly improved greatly under treatment and 11 days after the first injection the temperature had gradually dropped to normal.

Unfortunately the patient developed pulmonary embolism and died 20 days after the commencement of treatment.

The one case of pyæmia treated was a girl aged 11 years, suffering from pyæmia, originating in an acute osteomyelitis. There was a septic temperature and multiple abscesses formed almost daily. *Staphylococcus aureus* was cultivated from the pus and the blood, and a vaccine was prepared, of which she received three injections. The injections did not seem to influence the course of the disease and the patient died nine days after the first injection was given.

3. *Other Infections by Staphylococcus Pyogenes*.—These cases consist of one case of sycosis, one of furunculosis, one of carbuncle, and one case difficult to classify according to the ordinary nomenclature. The last patient (Case 70), a female, aged 43 years, had been under ordinary treatment for five months, for multiple recurring papules, becoming pustular with subsequent formation of granulomatous patches on the wrists, forearms and the front of the legs. The patches on the legs at one time formed plaques several inches in circumference. A culture of *Staphylococcus albus* was obtained from the pus, for which the opsonic index was 0.9. She has had injections for the past eighteen months, for although the patches cleared up during the first three months of treatment, there have been recurrences which have promptly yielded to a few injections.

CASE 71.—A male, aged 39, with sycosis due to *Staphylococcus albus* derived great benefit at first from vaccine injections but as he did not pay much attention to cleanliness, the condition relapsed and the patient discontinued the injections.

CASE 72.—A surgeon, aged 41 years, had had frequent infections on the hands, wrists and once on the knee. The inoculations were followed by various septic conditions, on two occasions endangering life. At other times there were a number of painful furuncles which were very troublesome. Many injections have been given and he has had no serious septic state since, though from time to time, furuncles form which a few injections soon clear away.

CASE 73.—A patient with carbuncles on the buttock and neck, made excellent progress after a staphylococcic vaccine had been administered. Though one recognizes that as a rule carbuncles

yield satisfactorily to treatment, the healing in this case was more rapid than usual, a freshly forming carbuncle aborted and there was very little of the depression which usually accompanies the disease.

In conclusion I wish to thank those medical men in Hull and the neighborhood who have so kindly sent cases to me for vaccine treatment.

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THE SERUM TREATMENT OF BACILLARY DYSENTERY

BY DRS. VAILLARD AND DOPTER

Professors at the Val-de-Grâce, Paris

THE nosographic term dysentery comprises forms of infection that differ essentially, in spite of the fact that their symptomatic appearances might lead one to classify them under a single rubric. Two leading varieties, perfectly distinct in cause as well as in lesions, have now been definitely distinguished in this group; and this knowledge is of great practical importance, since in the future the treatment to be applied to them will have to be a different one.

One form is due to a pathogenic protozoon, the *Amœba dysenteriae* or *Entamœba histolytica* of Schaudinn, whose presence in recent stools can easily be revealed by microscopical examination. This form of dysentery, called amœbic dysentery, which gives rise to hepatic abscesses, is peculiar to tropical climates; consequently in France we see it only in patients who have become infected while living in the colonies, or, much less frequently, in persons who, although never having left their native land, have been contaminated by cohabitation with the patients mentioned above. This form will not be referred to in this article; its specific treatment has yet to be discovered.

The other form, bacillary dysentery, is caused by a special microbe, the dysenteric bacillus, which is present in profusion in the diseased mucous membrane of the large intestine, and in the patient's stools. The infectious process due to this microbe usually remains localized to the colon, and is frequently accompanied by symptoms of intoxication due to the poisonous secretions spread from the region in which the microbe develops. The blood of these patients agglutinates cultures of the pathogenic microbe, a feature that can be employed for the diagnosis of doubtful cases, as is done in typhoid fever. This form of dysentery is found throughout the entire temperate zone, where it is common without ever giving

rise to hepatic abscess properly so-called; no other form has so far been observed in France, at least as an antochthonous disorder capable of spreading. Bacillary dysentery is essentially a summer complaint, and occurs in more or less extensive epidemics, whence arises the term of epidemic dysentery by which it is known. It is readily communicated from patient to patient, sometimes with very great facility. The death rate in this disease, which varies according to time and place, is often very high. We possess no precise data as to the death rate from dysentery among the civilian population in France, but it is a matter of common knowledge that annual epidemics are frequent in different regions, especially in the western part of the country, where they often assume a character of extreme gravity; it is not unusual in epidemics in Brittany to see the death rate rise to 20, 50 and even 60 per cent.

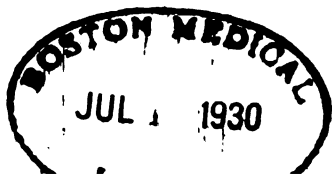
It can be readily understood that, as soon as one discovers the bacterial origin of a disease so deadly in effect as dysentery, every effort should be directed toward finding a specific treatment by means of the serum of animals immunized against the virus. Shiga (1898) was the first to take up this task, and since that time researches of a similar order have been carried on simultaneously in different countries (Kruse, in Germany; Rosenthal and Gabritchewski, in Moscow). During 1903, thanks to the liberality of the Pasteur Institute, we were able to immunize several horses against the dysentery bacillus, and reported to the Academy of Medicine the properties acquired by their serum, its antimicrobial and antitoxic power, its preventive and curative effect in the experimental dysentery of animals, and finally, its applications to the disease in man, based on the treatment of a number of cases of acute dysentery. The results of these experimental and clinical data show that this serum really constitutes the specific agent of the treatment of bacillary dysentery. We propose in this paper to limit ourselves to its principal effects in man.

EFFECTS OF THE ANTIDYSENTERIC SERUM IN MAN

The systematic use of the antidyenteric serum lessens the death rate in an evident manner. Setting aside the cases in which the serum could not act because it was administered to patients in extremis, and omitting as well dysenteric cases among the insane,

we have obtained the following results: 296 cases, among which were 127 serious or fatal cases, gave 5 deaths, or,—1.6 per cent. of death rate. The benefit obtained can be realized by comparison with the average mortality from dysentery in various countries: 24 per cent. in Japan (Shiga); 12 to 17 per cent. in Moscow (Rosen-thal); 11 per cent. in Westphalia (Kruse); 7 per cent. in Toulon, among the 129 cases of the epidemic of 1906; 20 to 60 per cent. in Brittany (Netter). These figures render all commentary unnecessary.

The criterium of the efficacy of this serum does not reside in the lowering of the death rate alone; it is also perceived in the almost immediate relief that it affords to these patients and in the rapidity of their recovery. It is the rule that a few hours after the injection the patient feels unmistakably better; abdominal pain, tenesmus and straining diminish, and, except in very grave cases, disappear almost always during the following twenty-four hours. At the same time the intestinal disorder undergoes a striking modification. The stools cease to be bloody. Their frequency, often so considerable, 50, 100, 150 or more per diem, decreases suddenly, and continues to diminish rapidly until there are only a few evacuations in the twenty-four hours. Beside this it is usual that in forty-eight hours after the first injection of serum the stools become less slimy and begin to assume again the fecal type, an indication of approaching recovery. This cessation of symptoms occurs more slowly in very serious cases, in which it only manifests itself after forty-eight hours. The general condition and symptoms of intoxication are quite as quickly affected. Vomiting and hiccough, when present, stop rapidly; central algidity or peripheral loss of heat, very common in the serious forms, are replaced by a normal temperature, while the pulse also becomes of a better type; the general weakness and prostration of strength is followed by a sensation of well being which the patients contrast with their previous state with manifest satisfaction. In short, the duration of the attack is very much reduced. Cases of dysentery of average severity are cut short in thirty-six to forty-eight hours, while serious cases, treated at an opportune moment, reach recovery in a lapse of time that does not exceed five to six days; in cases in which the intensity of the abdominal symptoms and the signs of



intoxication made the presage of a fatal termination invariable, recovery was obtained in ten to fifteen days. Finally, the convalescence is shorter and easier.

Different circumstances, intentional or fortuitous, enabled us to compare in the same patient the value of the traditional treatment with that of the specific serum. These were dysenteric patients who for six, eight and ten days had already been subjected to the treatment by means of purgatives and intestinal lavage. The disorder had not been modified, the colics, tenesmus and straining continued in the same degree; and the stools kept their frequency and their character of bloody mucus. As soon as the serum was injected the entire scene changed: there was immediate improvement and recovery in two or three days. The contrast is always striking.

It is easy to comprehend that the serum should act better and more rapidly than any other means of treatment at our disposal. Other methods have no specific character, they cannot affect the bacillus in the tissues themselves, and they have no action on its secretions. The serum, on the other hand, immunizes the system against the pathogenic microbe and its toxic products; by its phagocytic action it checks the development of the bacillus in the intestine, and its antitoxin annihilates the circulating poison.

The effects of the serum are rapid and decisive in direct proportion to the nearness with which it is administered to the onset of the attack; the infectious process can then be immediately stopped. As it is never possible to foresee the ultimate gravity of a case of dysentery at its start, it is always prudent to intervene as quickly as possible after the appearance of the initial symptoms. It is furthermore necessary that the serum should be administered in proper amounts, proportionate to the degree of infection, as the same dose is not sufficient for all cases, and a single injection does not always ensure success; on these details are based variations in the mode of use of the serum.

MODE OF USE OF THE SERUM

The antidysenteric serum prepared at the Pasteur Institute contains no antiseptic and can be given in large doses without

drawbacks. It is administered in the subcutaneous cellular tissue with the usual antiseptic precautions.

Doses.—The amount to be given varies with the stage of the disorder, the gravity of the attack, and the patient's age.

The gravity of the attack is estimated by the daily number of stools, by the intensity and repetition of the painful symptoms, and by the signs of intoxication.

The frequency of stools is almost always dependent on the distribution of the lesions in the large intestine. The activity and repetition of the abdominal colicky pains are usually in direct proportion to the extent and gravity of the alterations in the mucous membrane. The intoxication reveals itself principally by the following signs: vomiting, prostration, weak pulse, changed appearance, hypothermy, a condition of syncope, etc. If one is guided by these three elements the gravity of an attack of dysentery can be estimated. Taking into consideration more particularly the frequency of stools, it would be possible, though the classification is quite arbitrary, to establish the following division: Average cases, from 15 to 30 stools a day; severe cases, from 30 to 60 stools a day; serious cases, from 60 to 100 stools a day; very serious cases, 100 to 150 stools a day or more.

However, this division, which does not take into account the signs of intoxication, runs the risk of being, at times, inexact. For there are cases in which early toxæmia (algidity, weak pulse, tendency to collapse) appears with relatively moderate intestinal disorders, 15 to 20 stools a day; this form is a very grave one.

The variations in the clinical aspects of cases of dysentery do not make it possible to determine in an absolute manner the amount of serum necessary for recovery; but the following remarks, based on experience, will be sufficient to show the physician how to act.

Adults.—With dysentery of average intensity and taken at the start, 20 c.c. of serum is enough usually to produce immediate relief of symptoms and rapid recovery. If twenty-four hours later the colics continue with their original intensity, and if the stools though much less frequent are still abnormally frequent, it is desirable to repeat the injection. In some cases even, in the severe forms or in those that have already lasted several days, a third injection of a smaller quantity will be useful in hastening recovery.

In the serious cases, 40 to 60 c.c. must be injected at the start, and the same dose repeated the following day; if then the intestinal symptoms are not under satisfactory control, the administration of the serum should be continued in diminishing doses until there are only a few stools per diem. The physician must be guided by the character and frequency of the stools; so long as they are slimy and frequent the disorder cannot be held to be under control.

In the most serious cases, particularly when the administration of the serum is retarded, it is necessary to use massive doses at once: 80, 90 and even 100 c.c. divided into two injections during the day, until the intestinal conditions improve. Then, as has been said above, the serum injections should be continued in diminishing doses; it is wise to lessen the daily dose very gradually, so long as the number of stools exceeds 20 per diem.

Children.—In dealing with children the doses mentioned above should be reduced by half.

Relapses.—Relapse is unusual. It occurs after the tenth day that follows the last injection of serum, that is to say, when the action of the latter begins to be exhausted. Such a relapse is easily controlled by a single injection of serum.

DRAWBACKS TO THE USE OF THE SERUM

Like all therapeutic sera, the dysenteric serum gives rise to what are known as serum symptoms, urticaria, polymorphous erythema, arthralgia, myalgia, all of which may be accompanied by slight rise of temperature. Adults seem more liable than children to erythematous febrile manifestations. All of these sequelæ are very brief in duration and are never in any way serious. They can be avoided or at any rate attenuated by prescribing for the patient two or three *grammes* of calcium chloride on the day the injection is made and on the two following days.

Preventive Effect.—Administered in doses of 10 c.c. the serum gives temporary immunity against dysentery; this immunity lasts about ten or twelve days. It may sometimes be advantageous, where there are children in a family, to make preventive injections in the case of the persons exposed to contagion.

THE TREATMENT OF HÆMOGLOBINURIC FEVER

BY WILLIAM H. DEADERICK, M.D.

Marianna, Arkansas

THE discussion of the treatment of hæmoglobinuric fever has probably been productive of more harsh and prejudiced controversies than has any other question in therapeutics. The bone of contention is quinine.

It is unnecessary to review the history of the discussions or to rehearse the arguments for and against the etiological relation of quinine to blackwater fever. No valid conclusion can be reached except through the results of a large series of cases. The number of cases in the following collection is probably sufficiently large to eliminate all error and should be convincing. The first column of figures shows the number of cases, the second the number of deaths.

TREATED WITH QUININE.			TREATED WITHOUT QUININE.		
Vieth ¹	14	3	Tomaselli ⁴	30	6
Dryepondt ¹	28	1	Navarre ¹	2	0
Mense ²	22	0	Henric ⁴	2	0
Powell ²	9	7	Kohlstock ⁵	48	8
Gelpe ²	3	2	Koch ⁶	16	3
Diesing ²	2	2	Hopkins ⁷	6	1
Hagge ²	7	2	Bertrand ⁸	21	2
Schellong ⁹	7	3	Ollwig ¹⁰	15	0
Reynolds ²	1	1	Wittrock ¹¹	4	1
Doering ¹⁰	6	0	Ziemann ¹²	12	4
Hanley ¹¹	13	3	A. Plehn ¹³	53	5
Moffatt ¹²	9	2	F. Plehn ¹⁴	25	1
Gorgas ¹³	20	3	Kleine ¹⁵	15	1
Steudel ¹⁴	18	3	Krauss ¹⁶	15	0
Malone ¹⁵	120	14	Goltman and Krauss ¹⁷	12	9
Brem ¹⁶	14	2	Malone ¹⁸	35	0
Coste ¹⁷	15	7	Coste ¹⁹	10	4
Steggall ¹⁸	3	0	McElroy ²⁰	25	4
Woldert ¹⁹	5	0	Hearsey ²¹	15	4
Otto ²⁰	1	0	Seal ²²	6	1
Schlayer ²¹	1	0	Cardamatis ²³	524	36
Austin ²²	1	0			

TREATED WITH QUININE.			TREATED WITHOUT QUININE.		
Herrick ^m	8	0	Ruge ^m	1	0
Curry ^m	1	1	Dryepondt & Van-		
Cardamatis ^m	1603	428	campenhout ^m ..	1	0
1931 cases,			Howard ^m	1	0
484 deaths,			Ketchen ^m	1	0
mortality 25 per cent.			Masterman ^m	1	1
			Herrick ^m	1	1
			Curry ^m	1	1
			898 cases,		
			93 deaths,		
			mortality 10.3 per cent.		

While the results of the series prove that the mortality is higher under the routine treatment with quinine, they should not be taken to exclude absolutely the use of quinine in some cases of hæmoglobinuric fever, for under certain circumstances quinine may be of value. It is difficult, in fact sometimes impossible, to say whether quinine is indicated or contraindicated in a certain case.

Mannaberg ⁴⁰ gives the following general rules to aid a decision:—

1. When, without quinine preceding, hæmoglobinuria occurs and the blood examination shows the presence of malarial infection, quinine is undoubtedly to be exhibited.

2. When the hæmoglobinuria occurs after one dose of quinine, while the anamnesis shows that the patient previously took quinine without bad effect, and the parasites are present in the blood, the use of quinine is also indicated. If a paroxysm of hæmoglobinuria should follow within a few hours, the repetition of the drug should be made dependent upon whether or not the parasites have in great part disappeared. In the former case the quinine may be stopped, at least for a time. But if the blood examination shows that the parasites have increased in number the quinine is to be continued.

3. When the anamnesis shows that the patient suffered previously from hæmoglobinuria following quinine and the blood examination is negative, quinine is to be absolutely avoided.

4. When the case manifests a severe malarial infection (numerous parasites on examination) and at the same time an assured intolerance to quinine in the shape of hæmoglobinuria, the decision is very difficult.

Marchiafava and Bignami ⁴¹ believe that the only guide indicating to the physician whether to give or to withhold quinine ought to be the result of a blood examination.

Bastianelli's ⁴² canon is as follows:—

1. If hæmoglobinuria occurs during a malarial paroxysm and parasites are found in the blood quinine should be given.

2. If parasites are not found in the blood quinine should not be given.

3. If quinine has already been given before the hæmoglobinuria has appeared and no parasites are found, its use should be suspended; but if parasites persist it should be continued.

Thayer ⁴³ states his rules, modified from Bastianelli, thus:—

1. If the attack occur spontaneously with a malarial paroxysm, the blood showing the presence of parasites, quinine should be freely administered hypodermically or intravenously.

2. If the parasites have disappeared, either as a result of the paroxysm itself, or of doses of quinine already given, it may be as well to abstain, at least for a time, from the administration of the drug. It cannot ameliorate the further course of the paroxysm and the possibility, if it has been already given, that the symptoms may be in part due to quinine may be thought of.

3. If an attack arise in the middle of an ordinary malarial infection, after the taking of quinine, it may be best to abstain for a time, at any rate, from the further use of the drug. That which has been given may have been enough to control the affection.

4. If, however, in an attack coming on after quinine, the parasites continue to develop, quinine should be again administered despite the slight possibility of its injurious action. The dangers from the further development of the parasite are probably the greater.

5. In postmalarial hæmoglobinuria quinine is, of course, useless.

It may be seen that the authorities quoted lay great stress on the presence of the parasite as a guide to the administration of quinine. The writer however cannot agree with those who hold that quinine should be exhibited in every case where the microscopic examination shows the presence of parasites. It has been shown conclusively that parasites are present in a very large pro-

portion of cases examined early. It has also been shown that in an equally large number of cases the parasites disappear spontaneously. In these cases quinine is, to say the least, superfluous. Probably the only conditions in which quinine is indicated are, first, where the parasites show no tendency to disappear after 48 hours from onset; secondly, in the infrequent cases of intermittent hæmoglobinuria where the outbreak corresponds with parasitic sporulation.

Even in cases of mildest onset the patient should be confined to bed from the start and should be kept quiet either by persuasion or by sedative. Sudden death on slight exertion sometimes occurs. The patient should not be transported from one place to another; the Plehn brothers observed anuria as a frequent consequence of moving patients from place to place. Chilling the body, especially when the temperature is low, should be carefully avoided. When vomiting is not a prominent feature liquid nourishment may be given freely; buttermilk and albumen water are the most suitable. Sweet milk is often ejected as a thick curd, moulded ropy by the œsophagus in the act of vomiting. Animal broths, barley and oat-meal water, lemonade and orange juice are allowable. Rectal alimentation is unsatisfactory.

There is no specific. Methylene blue has proven disappointing and besides is a renal irritant. Salicylic acid probably has no effect further than to upset the stomach and increase the discomfort. With the false idea that a hæmorrhage had to be checked gallic and tannic acids, ergot and similar drugs are frequently given; these cannot possibly be of any benefit.

The bowels should be moved early and often and calomel possesses advantages over other purgatives: it is more easily retained, is a bland diuretic and is the best of intestinal antiseptics. Too large doses are usually advised; three to five grains are, as a rule, sufficient, repeated *pro re nata*.

Quennec's⁴⁴ chloroform treatment has been successful in some hands. The originator claims for the method three points of value:—1. Controls vomiting. 2. Increases output of urine. 3. Diminishes albuminuria. He treated more than fifty cases with no mortality. The following is his formula:—

Chloroform	6 grammes.
Gum arabic	8 grammes.
Sweetened water	250 grammes.

This amount is taken daily, a sip every ten minutes. In addition Quennec used quinine, 1 gramme daily subcutaneously, and sulphate of soda and senna by rectum. The excessive administration of chloroform might be harmful as it is a cardiac depressant, renal irritant and lowers blood pressure.

Hearsey²³ used with good results a modification of Sternberg's yellow fever treatment. The original Sternberg formula is: sodium bicarbonate 150 grains, mercury perchloride $\frac{1}{3}$ grain, water 2 pints. Sig: An ounce and a half every hour. Hearsey gives sodium bicarbonate 10 grains, liquor hydrargyri 30 minims every two to three hours.

A method of treatment which deserves a thorough trial is that of Vincent.²⁵ This writer maintains that calcium chloride is not only a preventative but has extraordinary curative powers. During the attack from four to six grammes are given daily by the mouth or from one to two grammes dissolved in normal salt solution hypodermically. He asserts that it acts as an antihæmolyisin and that in persons in whom an attack of blackwater may be provoked at will by a dose of quinine, the previous administration of calcium chloride will forestall the outbreak. It is worthy of mention that this drug has been used successfully in paroxysmal hæmoglobinuria by Saundby, and in hæmophilia by Wright, Carrierre, Arthus, Labbe and others.

Hyposulphite of soda, introduced into the treatment of malarial conditions by Polli, in 1867, has been used extensively in the treatment of hæmoglobinuria. Its use is probably not attended by any signal results. O'Sullivan-Beare⁴⁵ used with good results a decoction of the root of *cassia beareana*, a native plant. Gouzien²⁵ employed an infusion of the leaves of *cassia occidentalis*.

The fever does not usually run sufficiently high to call for treatment. The coal-tar preparations should be assiduously avoided. Cold baths may be productive of harm by increasing the blood destruction but in hyperpyrexial cases sponging with tepid water may be resorted to.

Vomiting, if not intense, is often benefited by a mustard plaster on the epigastrium. The fly-blister, formerly used should be abandoned. Draughts of hot water or carbonated water sometimes assist in relieving this troublesome symptom. Cracked ice may be tried. Morphine hypodermically should be given unhesitatingly when other measures fail. Any evil effects are more than outweighed by its enabling the stomach to retain liquids.

It is imperative to allay the restlessness often present in these cases. For this purpose chloral and bromide of soda by rectum, morphine hypodermically, or sulphonal or small doses of chloroform by mouth are useful.

Probably the most important indication in the treatment is the prevention of suppression. Medicinal diuretics usually do harm. One, turpentine, widely used in some sections, should be mentioned to be condemned in the strongest terms. It is one of the most violent renal irritants and in some persons small doses may cause suppression or hæmaturia. Water is the best diuretic and as much should be given by mouth as will be retained. Lewis,⁴⁶ of North Carolina, was the first to recommend the use of normal salt solution by hypodermoclysis and by the rectum in the treatment of hæmoglobinuric fever, though Laveran⁴⁷ credits this to Gouzien. The latter recommends the daily injection of 100 to 300 grammes of a 0.7 per cent. solution in conjunction with the rectal injection of 200 grammes four to six times in 24 hours. The use of physiological salt solution is the very best means of combating and treating anuria. In mild cases where the urine is free the rectal use is usually sufficient, but in cases where suppression threatens or is imminent the solution should be used subcutaneously and in larger quantities and oftener than advised by Gouzien.

Werner⁴⁸ suggests nephrotomy for anuria. Ziemann²⁶ mentions a case ending fatally in which the renal capsule was split. If surgical measures are contemplated the Edebohls operation would be the most logical procedure.

Supportive measures are essential. Alcohol in all forms is inadmissible. Strychnine is useful and should be given hypodermically when circumstances permit. Digitalis has proven serviceable. Doering¹⁰ had good effects from strophanthus. The

aromatic spirits of ammonia and hypodermic injections of ether have been recommended. Transfusion of blood has been used, it is said, with excellent results. The elder Plehn⁴⁹ says that he had four attacks in which Kohlstock treated him with inhalations of oxygen and that nothing else did him so much good.

The after-treatment should have a care for the diet, which should be non-nitrogenous and consist largely of liquids at first. A tonic of organic iron is indicated and digestive disorders when present should receive appropriate treatment.

Persons showing marked susceptibility to quinine in the shape of a tendency to hæmoglobinuria may be immunized and relapses thus prevented. Koch's⁵⁰ method is to begin with one-tenth gramme and increase by a like amount daily, observing closely the temperature and the urine. If the temperature rises or the urine becomes distinctly darker no further attempt to increase the dose should be made.

In the present state of our knowledge it is probably Utopian to discuss the treatment of hæmoglobinuric fever by anti-hæmolytic sera but such has recently been successfully accomplished by Widal and Rostaine⁵¹ in paroxysmal hæmoglobinuria.

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Medicine

THE CHANGES IN THE OUTLINES OF THE HEART, DIAPHRAGM AND STOMACH DURING THE PHASES OF RESPIRATION AS ILLUSTRATED BY THE X-RAY

BY RICHARD J. BEHAN, M.D.

OF PITTSBURG, PA.

THE following studies were made with the idea of clearing up the shadowy knowledge connected with the position of the stomach and heart; their relationship and size in a normal adult; position, size and relationship to diaphragm during both stages of respiration, and the changed relationship, if any, which these assume during dilation of the stomach. Much work has been done in this connection by Rieder, Phaler, Cannon and others but none so far as I know with the objects, which I have stated above, in view. The technic of my examinations was as follows:

1. All the examinations, of which I have a series of 15, were made with the patient in the standing position with the back toward the tube, the anticathode of which was at a distance of 30 cm. from the tenth dorsal vertebra and directly posterior to it.

2. One and a half ounces of bismuth subnitrate suspended in about 4 ounces of water was given, and the patient was then instructed to move from side to side; to make the coating on the wall of the stomach more even, the patient was instructed to roll over several times.

3. He then stood erect and I proceeded with my examination. First.—The normal position of the stomach, the heart, and the diaphragm were noted, then having him take a deep breath I noted the changed relationship caused by the deep inspiration, then having him expel as completely as possible all the air in his chest and I again noted the relationships. After these examinations were

completed I had the patient take about 30 ounces of water and then a second series of observations were made.

Stomach.—The stomach moves with respiration. The picture shows the condition fairly well and one fact must be borne in mind—namely, that both curvatures of the stomach seem to be affected by respiration and that the stomach is not turned on an axis—having as its centre the gastro-oesophageal attachment at the diaphragm.

Peristalsis of the stomach is manifested principally on the lesser curvature—the peristaltic waves being from left to right. The upper border of the stomach when it is filled lies in close approximation to the diaphragm. It seems that the curvature of the lower border is greatest during ordinary respiration, and decreases during both inspiration and expiration, being least during expiration.

FIG. 1.



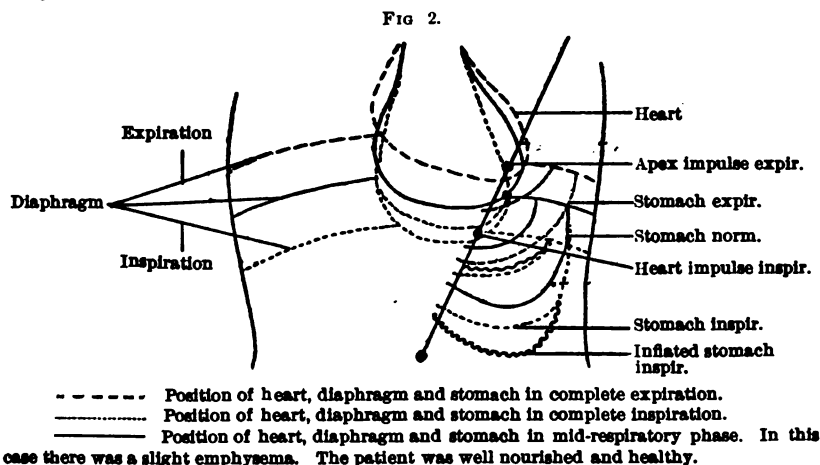
Outlines of stomach. D B, Greater curvature. A C, Lesser curvature.

Reversed Peristalsis.—The reversed peristalsis was noticed and well illustrated in the case of Andrew T. He was neurasthenic, hysterical, and had a habit of belching air. During his belching proceedings the reversed peristalsis along the lesser curvature was clearly defined and ran in the direction of C to A as is illustrated in Fig. 1.

The patient could also produce a belching at will. During the belching the stomach was depressed considerably from the diaphragm and the peristaltic wave could be seen running along the lesser curvature from the pylorus to the cardia. During this time the abdominal muscles were in a state of contraction and air would be expelled from the mouth. This case would seem to indicate that peristalsis is to some slight extent at least under the supervision of the will.

Spalteholz claims that: When the stomach is full it passes markedly to the right and at the same time becomes lower by about the level of one vertebra. This I have not found to be the case—as in my examination, the stomach after being dilated with 30 ounces of fluid did not seem to change, to any great extent, its relative position in the abdomen. The upper and lower borders alone seemed to be affected; the lesser curvature being raised to a slight extent. The upper border was raised 1.2 cm. while the lower border was depressed—1.5 cm. The raising of the upper border consists of a straightening of the curvature while the depression of the lower border consists in a deepening of the curvature.

A full stomach may influence the action of the heart in two ways:



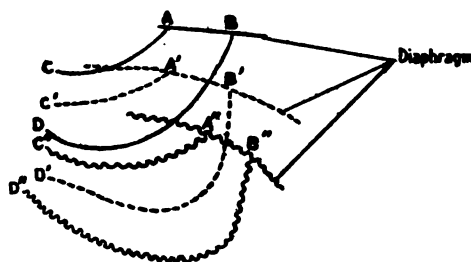
1. By exerting a much greater traction on the diaphragm because of the increased weight when it is full—the increased force drawing down the diaphragm which in turn pulls upon the heart—owing to the attachment of the heart to the diaphragm by means of the pericardium.

2. The lesser curvature is pressed against the diaphragm which in turn exerts pressure upon the heart and hinders it in its work. When the upward expansion of the lesser curvature is hindered because of some thoracic disease which causes a persistent forced descent of the diaphragm, we find the lower or greater curvature descending instead of the lesser curvature ascending, on dilatation

of the stomach. No apparent change from the normal is present in the heart during either of the respiratory phases when the stomach is in a state of dilatation. Neither is any change noticed in the relationship between the stomach and diaphragm.

Measurements.—The average length of the stomach taken from the point farthest external on the left side to the point farthest internal on the right where the shadow was apparent, gave as the normal length 13.8 cm. (5.5 inches) while on inflation or on dilatation with 30 ounces fluid (water) it was 15.1 cm. (6 inches). The greatest width of the stomach was 6.6 cm. (2.6 inches) empty and 9.2 cm. (3.68 inches) when dilated with 30 ounces of water. According to Sappey, quoted by Gray, the average distance between

FIG. 8.



A C, B D, Outlines of stomach in complete expiration. A' C', B' D', Outlines of stomach in normal position. A'' C'', B'' D'', Outlines of stomach in complete inspiration.

the lesser and the greater curvature was 10 to 12 cm. (4 to 5 inches) which is considerably more than I found in my examinations.

Movement of the Stomach with Respiration.—The stomach changes its position during the different phases of respiration. During deep inspiration it assumes more nearly the transverse position, as is given by the older authorities, while in complete expiration it assumes more nearly the position in which its longitudinal diameter approaches a vertical line—this is the position as given by the latest authorities. This is well illustrated by the tracing made from Case XII of my series.

In all the cases it will be noticed that the pyloric part is fairly stationary and that it does not move to any considerable degree while the movement up and down at the diaphragmatic attachment

is of much greater extent. The stomach seems to revolve to a slight degree around the more fixed pylorus. The stomach is also influenced by the contraction of the abdominal muscles as in one case the stomach walls, especially the lesser curvature, were raised and lowered by the contraction of the abdominal muscles. I had asked the patient to take deep breaths, when, instead, he took very short and shallow ones using the abdominal muscles in the act. From this fact I have concluded that the abdominal walls have considerable influence on the position of the stomach and can understand how, in cases of laxity of the abdominal muscles, the stomach may be greatly depressed.

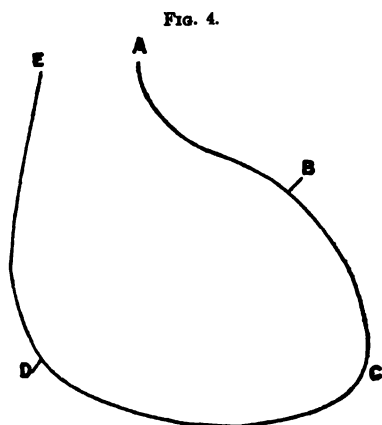
Diaphragm.—Normally the diaphragm is arched and is higher on the right side than it is on the left. This is as is usually given and of course is due to the liver being on the right side. The normal excursion of the diaphragm is 1.3 cm. for the left and 1.25 cm. for the right. It is well to take notice that the expiratory (forced) excursion is much greater than is the inspiratory (forced) excursion—this is based on a well defined anatomical basis, namely: that in the abdomen we have many viscera hindering the descent of the diaphragm while in the chest during expiration we not only have an absence of air-filled organs which would hinder the ascent, but have the collapsed lung aiding through the means of suction the ascent of the diaphragm. It is also to be noticed that in the central part of the diaphragm immediately beneath the heart there is a depression on which the heart rests. This depression probably is due to the weight of the heart, as the shape of the depression closely corresponds to the convexity of the superimposed heart.

The excursion of the diaphragm from complete expiration to the deepest inspiration amounted on the right side to 7.01 cm. while on the left it amounted to 6.9 cm., almost the same figure.

During expiration the heart exercises traction on the diaphragm which can be seen to perform a rhythmical up and down movement with each systole of the heart. The impulse extends to a greater distance on the left side than it does to the right side of the apex. (Case VIII ($1\frac{1}{2}$ inches)—3.75 cm. more to the right than to the left of the apex). The excursion of the diaphragm is about .625 cm. ($\frac{1}{4}$ inch).

During complete expiration the right cardio-diaphragmatic angle is increased so that instead of an acute we have an obtuse angle. In Case VIII three-quarters of an hour after eating, the convexity of the diaphragm over the liver seemed to be increased; this was probably due to the increased blood supply of the liver and the consequent turgidity during the digestive period. In case of hypertrophy of the liver the inspiration is somewhat restricted, *i.e.*, the excursion is not as great as in normal conditions, especially on the right side.

Shape of the Heart.—The shape of the heart varies during the different stages of respiration. During the normal state in the intervening period between complete inspiration and complete expira-



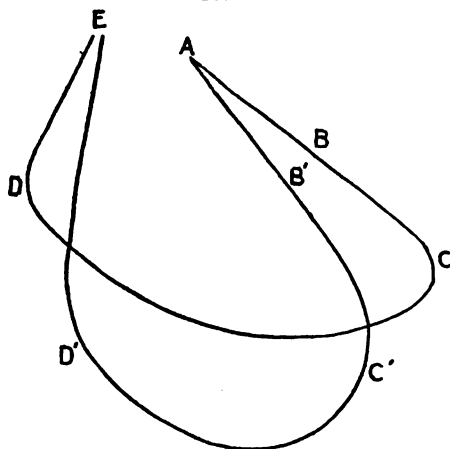
Shape of heart in the mid-phase of respiration.

tion—when it is at a period of comparative rest, it is of the shape indicated in the figure, with a somewhat straight right border, a well marked curved left border with a hump, B, present in it about half way between the base and the apex—the apex being well rounded and not of the sharp and pointed form as is usually described.

During expiration the heart seems to be squeezed up into a smaller compass, the apex is raised and is displaced to the left so that the hump B is obliterated. The lower border is much higher at the right base than at the left base. This seems to be due to the fact that the liver being beneath the diaphragm at this point when

the abdominal walls are made tight by the contraction of the parietal muscles, the viscera are pressed upward against the liver and thus afford a wider and more uniform base for the upward pressure than the remainder of the diaphragm, beneath which are the stomach, pancreas, and spleen. The stomach is attached to the left side of the diaphragm and may retard its upward process: first, by its weight and the weight of the contained material, and secondly, by the traction which it exerts because of its connections to other organs, such as the traction from the colon exerted through the gastrocolic ligament or rather omentum.

FIG. 5.



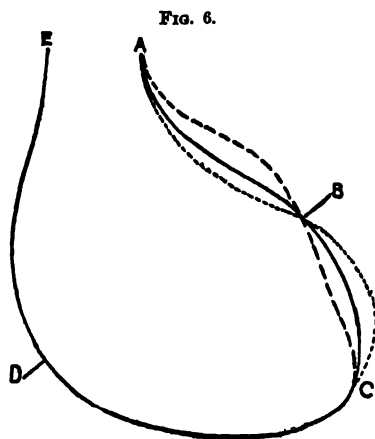
A B C D E, Outlines of heart during complete expiration. A' B' C' D' E, Outlines of heart during complete inspiration.

During expiration the heart seems to be rotated on its long axis, so that the right side of the heart is thrown against the chest wall. Such a position would be an excellent one for the transmission of impulses from the right heart to the chest wall and such we find to be the case—the heart impulse to the wall being much greater during a state of expiration than during inspiration.

During inspiration the heart seems to be compressed laterally perhaps from the traction or compression exerted upon it by the pericardium. The pericardium is attached to the central tendon of the diaphragm and as the diaphragm descends it pulls the heart with it and thus exerts a lateral pressure upon the sides

of the heart, and as a consequence obliterates the angle at the apex and at the right base so that it comes to resemble somewhat a pear, with the broad side down toward the diaphragm and the narrow stem part up near the base. In some cases where the pericardium is fairly lax and the diaphragm is rather strong, the heart is slightly separated from the diaphragm and on examination with the X-ray a clear space is seen between the two.

The right cardio-diaphragmatic angle varies during the different phases of respiration, being most acute in deepest inspiration and most obtuse in the complete expiration. This is a useful fact to



Showing changes in outlines of left side of heart during contraction.

bear in mind especially when we are trying to map out "Epstein's angle" in cases of pericarditis with effusion. We must elicit the sign during inspiratory distention or else during the normal respiratory rest and never during complete expiration. The left cardio-diaphragmatic angle varies like the right—its shape changing during the different respiratory phases. According to Butler we find that in forced inspiration the diaphragm descends, drawing the heart downward and inward owing to the attachment of the pericardium to the central tendon of the diaphragm—at the same time the ribs ascend, thus further altering the relationship of the heart to the chest wall. This was confirmed by my examinations. Butler also says that in forced expiration the diaphragm forces the heart upward and seems to compress it so that it looks very flat and

compressed. The apex is forced upward and to the left while the base also extends further out to the right side. The excursion of the diaphragm may be as much as 2 inches. I found that it might be on an average about 2.8 inches or 7.01 cm.

Contraction of the Heart.—Two motions can be seen to the heart, a downward wave-like motion and a lateral twisting motion,—as the ventricle contracts the auricle dilates, then the auricle contracts—then a slight pause ensues and both again undergo the same cycle.

The curve of the left lateral surface of the heart is as indicated in Fig. 6. At the most convex part marked B is the intersection of two wave motions, and the dash line A-C indicates the dilatation of the auricle and the contraction of the ventricle while the dotted line A-C represents the contraction of the ventricle and dilatation of the auricle. These contraction waves follow each other very closely and in regular sequence. It is very interesting to watch the regular rhythm of the contraction, which resembles the throbbing of a great engine, one movement following the other with the regularity of clock work. The contraction of the heart seems to be slow and orderly—and after complete contraction a short pause ensues. There does not seem to be much change in the rapidity of the contraction of the auricles and ventricles, the contraction seeming to pass from the auricles to the ventricles in a continuous wave-like motion.

In nearly all the cases examined a dark line was present to the right of the heart. It was not affected by change of position, though on expiration when the heart was pushed up the width of this shadow seemed to be decreased. After considerable deliberation I omitted the vena cava as a causative factor in the production of the shadow, and finally decided it was produced by the pericardium.

The facts elucidated above are slightly different from those given by most authorities for Haycraft (Kirke) claims the heart undergoes no change of shape in the unopened chest during its contraction, and according to Kirke the action of the heart during contraction is as follows: The whole heart moves slightly towards the right and forward, twisting on its long axis and exposing more of the left ventricle anteriorly than is usually present in diastole; when the systole ends, the heart resumes its former position rotating

to the left again as the pulmonary artery and the aorta contract. Ludwig (Kirke) claims that during contraction, the length of the heart is not altered but that the plane of the base is diminished.

Apex.—Normally the apex impulse is found 2.6 cm. (1.04 inches) below the left nipple and 1.1 cm. (.44 inch) internal to it. It must be borne in mind that the position of the apex is not constant but varies; its position from the midsternal line was found to be 8.9 cm. (3.9 inches). During the two phases of respiration the apex position varies, the average position during forced inspiration was 6.78 cm. (2.712 inches) down from the nipple and 2.46 cm. (.984 inch) internal to the nipple. Great variation was noted in the position of the apex in regard to the nipple during forced respiration. In two of the cases the apex was directly above the nipple while in one it was directly external to it on the same level. In one it was directly at the nipple while in three it was downward and slightly inward from the nipple. These figures show the great variations that occur when the nipple is used as an anatomical landmark. Had some other point been taken I am sure that we would not find such great variations. In the one case where the heart apex was displaced outward on expiration, the heart was very much enlarged and had much greater diaphragmatic width than normal. In the cases in which it was displaced directly upward the measurements almost coincided with the average measurements. In the two cases where the apex was displaced upward and outward the diaphragmatic width and the length of the heart were almost exactly similar. From the facts stated it does not seem as though we could determine any definite ratio between the amount of displacement and other measurements of the heart. The apex, in an average of the measurements from six normal hearts, was found to be 2.6 cm. below the nipple and 1.1 cm. internal to it. These measurements are less than are generally given in the text-books, seeming to indicate that the heart is slightly larger than is supposed. Here the ratio between the size and the position of the apex seems to be somewhat constant. The heart which has the longest longitudinal diameter having its apex generally at the lowest point though not necessarily at the most external point, for practical purposes no definite ratio can be established between the size of the heart and the position of the apex.

Apex Impulse.—The apex impulse is normally in the fifth interspace. I have not measured the position of the apex impulse, except from the midsternal line. The apex impulse travels in the direction which the apex of the heart takes in the various phases of respiration. The line connecting the apex impulse during the greatest depth of inspiration with the apex impulse during the period of most absolute expiration will pass slightly internal to the apex impulses when the heart is in its normal phase of activity. This indicates, I judge, a rotation of the heart on its long axis from left to right on deep inspiration and from right to left on pronounced expiration—thus throwing the left ventricle against the chest wall on expiration and the right ventricle against the chest wall on deep inspiration. (See Fig. 7.)

In regard to the right base—the extreme of the right lower part is found (from six observations) in two instances to be at the sixth rib, in two at the sixth costal cartilage, and in two to be at the seventh rib. The average distance from the midsternal line is 3.9 cm.

During forced expiration in three cases out of six the base was at the fourth interspace, in one at the third rib, in one at the third interspace and in one at the fifth rib. The average distance of the base from the midsternal line was 4.5 cm. (1.8 inches). The normal position of the base was fifth rib in two cases, sixth rib in three cases, seventh rib in one case. The average distance was 3.8 cm. (1.58 inches) from the midsternal line. The excursion of the heart from a position which it assumes in complete expiration to one of the deepest inspiration was: Case 6, 2.5 cm.; Case 7, 2.75 cm.; Case 9, 1.5 cm.; Case 11, 4 cm.; Case 12, 2 cm. The averages of these distances is 2.5 cm. (1.2 inches). The differences between the position of the heart in complete inspiration and complete expiration is demonstrated in the accompany table.

NORMAL AND COMPLETE INSPIRATION.

Case 6.....	1.0
“ 7.....	0.75
“ 9.....	2.0
“ 11.....	3.0
“ 12.....	1.0

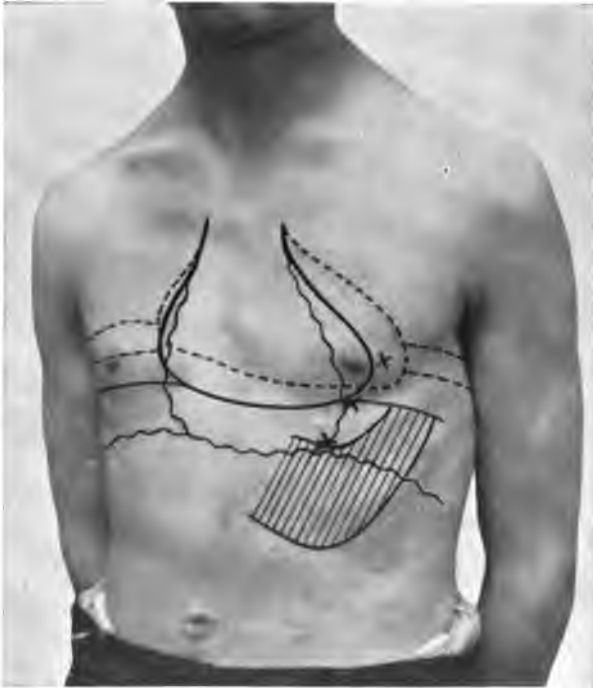
Average 1.55 (.62 in.)

NORMAL AND COMPLETE EXPIRATION.

1.5
2.0
2.0
1.0
1.0

1.5 (.6 in.)

FIG. 7.



The figure shows the relative position of the heart and diaphragm, also the position of the stomach, though in the figure the pyloric portion is represented as being wider than it normally is. The dotted and wavy lines represent the extremes of inspiration and expiration.

Number nine is a case in which the liver is enormously enlarged but still we see that the excursion of the heart is even a little above the average, a condition which under the circumstances we would not expect to find. The average distance between complete inspiration and the normal is 1.55 cm. (.62 inch) and the average between expiration and the normal is 1.5 cm. (.6 inch). The average between the position on complete expiration and the fullest possible inspiration is 3.05 cm. (1.22 inches). The measurements of necessity were taken at different levels of the chest. The average distance of the base from the midsternal line is 3.9 cm. (1.56 inches). According to Vierordt it is 4 to 5 cm., while Babcock gives it as 2 cm. beyond the sternal margin for a man of 120 cm. height, and 3 cm. sternal margin for a man of 130 cm. height. The average distance of the apex from the midsternal line is 8.9 cm. (3.56 inches); according to Vierordt it is 8 or 9 cm., while Hornkohl gives 8.8 cm.

Normally when the stomach is empty the heart during contraction becomes shorter in its longitudinal diameter and draws the diaphragm up with it to a distance of about .675 cm., but when the stomach is dilated with some intragastric material the normal up and down movement seems to be increased and decreased to a much greater extent than occurs with an empty stomach.

VALVULAR HEART DISEASE *

BY JOHN G. CECIL, B.S., M.D.

Professor of the Principles and Practice of Medicine and of Clinical Medicine
in the University of Louisville, Medical Department; President
of the Kentucky State Medical Association; Medical
Director for the Inter-Southern Life
Insurance Company, etc., etc.,
Louisville, Kentucky

GENTLEMEN:—This patient, a female, is thirty-eight years of age, married, occupation housekeeper. She has a normal temperature this morning, pulse 88, respiration, 28. Previous history: father dead as result of accident, mother died of old age, one brother and four sisters living and in good health. The patient says she has had the ordinary diseases of childhood, and in addition pneumonia, followed by typhoid fever, about seventeen years ago. It is doubtful, however, whether she had the two diseases mentioned at one time. Not infrequently do we see persons having typhoid fever who develop a pneumonia afterward, but more often than otherwise we will find it to be a case of pneumonia in which there develops a so-called "typhoid state," and this may run along for an indefinite length of time, the patient making a very slow and perhaps an imperfect recovery. These two diseases date back seventeen years, and I would like you to fix that in your minds, because it may have some bearing in tracing the cause of conditions to which I shall presently call your attention.

The patient's present trouble is as follows: She complains of pain in the region of the heart, shortness of breath, fluttering of the heart, especially after any excitement. I have not yet examined this woman, and so far as I am advised she has not heretofore applied to the clinic for treatment or advice.

Physical examination indicates that she has very decided organic disease of the heart: There is a loud blowing murmur which

* Clinical Lecture delivered at the University of Louisville, Medical Department.

is heard most distinctly with the first sound of the heart, which is transmitted upward into the neck; also a similar sound is heard with the apex beat of the heart, which is transmitted into the axillary region.

In studying organic disease of the heart, it is always well to investigate the previous history of the patient carefully, we must search for the cause, something which antedates the heart disease, and that has acted as the causative factor. We must remember that valvular heart disease is seldom a primary affection. Not once in twenty-five times will you discover a well-defined heart murmur that is due to valvular leakage constituting a disease which began originally in the heart. In nearly every case something has preceded it, in other words the heart lesion is secondary and not the primary disease.

Now, we will see if we can find what disease antedated, or was the primary causative factor in this case. You will observe that the first question I ask the patient is if she has ever had rheumatism. The importance of this will be recognized when I tell you that at least fifty per cent. of the cases of organic heart disease are preceded by inflammatory rheumatism. That is the reason why we always ask the question, and why life insurance companies are so insistent upon their rule of rejecting applicants for insurance where there is a clear history of severe and especially repeated attacks of rheumatism.

The patient before us does not give any such history. She is now thirty-eight years old, and does not remember to have ever had an attack of rheumatism. However, as a child she may have suffered an attack of acute inflammatory rheumatism which laid the foundation for disease of the heart, and which might not have manifested itself until thirty years afterward! So while acute rheumatism does not often kill people, it lays the foundation for heart disease from which people do not recover, because when once the heart is organically diseased it does not get well, that is to say there is no cure for valvular leakage or for insufficient closure of these valves, which is always due to distortion, deformity, inflammatory adhesions, or other trouble about the valves.

Scarlet fever is another disease which is an occasional forerunner of heart disease. It is always well when you are studying

heart affections, if you do not obtain a clear history of acute rheumatism, to inquire closely into the matter of other diseases from which the patient may have suffered. Scarlet fever lays the foundation for heart disease which in some measure is similar to that of rheumatism; but there is this to be remembered concerning the two diseases (rheumatism and scarlet fever), rheumatism may originate in the heart itself, may manifest itself there first, or even possibly only there; and of course when the disease does not involve any of the large joints, but only manifests itself in the heart, it is more than probable that the diagnosis would be overlooked. Of course the rule is that rheumatism first affects the joints, and involves the valvular structures of the heart secondarily. Scarlet fever, on the other hand, when it does affect the heart, while it may produce changes which will result in organic disease of the valves, is more likely to produce a condition of the heart which will manifest itself very promptly; in fact not infrequently do we see cases of scarlet fever that are decidedly convalescent from the scarlet fever, almost or quite well apparently, and then suddenly die from heart failure, acute dilatation or ulcerative endocarditis. In such cases the infection is directed most likely, and almost exclusively we may say, upon the muscular structure of the heart walls, a fatty degeneration very probably of the heart muscle due to the toxins of scarlet fever which permits of enormous dilatation of the heart from which the patient dies. Or it may result in some affection of the nerves which control the heart, cardiac paralysis ensues, and the patient dies suddenly. There are still other instances which follow scarlet fever where there is a foundation laid for organic disease of the valves, in which sooner or later, sometimes many years afterward, there develops a regular organic or valvular disease of the heart. In the case before us we are unable to obtain a history of either rheumatism or scarlet fever preceding the development of the heart disease from which the patient now suffers.

What are the other common etiological factors which lead to heart disease? One of the most frequent which brings about heart disease is known as the "occupation cause." We have a common example of this in what is known as the athlete's heart which develops in those who play football, the rowers in racing boats,

those who run foot races, and those who lift heavy weights,—anything in other words which puts the heart on a short but extreme strain is likely to develop a condition which will end in organic cardiac disease. It is a notable fact that athletes do not attain great age. They are the strongest, best developed and look like the healthiest people in the world, yet they do not attain great age as a rule, and this is largely on account of heart involvement. I can recall this fact, that during my college days I graduated with a class of one hundred and eighteen, and within twenty years after graduation of that class, practically every one of the men who graduated with me who were known as athletes was dead! The men who could manage the heaviest dumb-bells, men who were the “stroke” rowers among the oarsmen, those who outran the others in foot races, etc., were the ones who succumbed to heart disease!

The work incident to certain occupations has been known to bring about a condition similar to the athlete's heart due to overstrain, overdilatation, or extreme hypertrophy of the heart; for instance such as log-rollers, men who engage in general work about lumber camps and who are constantly putting forth every possible effort in the rolling and lifting of logs, etc. It does not hurt a man nearly so much to lift a hundred pounds many times during the day; in other words a man can shoulder a sack of wheat, we will say, weighing one hundred and twenty pounds, and do so many times a day, and it will not hurt him nearly so much as it would to lift three hundred pounds at one time. Athletics and gymnastics do not hurt the heart when they are performed in an ordinary reasonable way, on the contrary they are useful and beneficial. It is the extra strain, the extreme tension, the extraordinary effort which strains the heart, and that is the reason why athletes and log-rollers develop heart disease and die early. So it will be seen that occupation has something to do with the development of organic heart disease in not a few instances.

Still further among the etiological factors in the development of heart disease are certain habits, notably the whiskey habit, the use of alcohol. The over-use of alcohol is responsible for a certain proportion of cases of organic heart disease. Under these circum-

stances disease of the heart comes about in a very insidious way, and is generally preceded by more or less arteriosclerosis.

Certain diseases which have not yet been mentioned are also accountable for the development of organic heart disease, this is particularly true of syphilis and especially when it develops in those of intemperate habits; the combination between syphilis and the use of alcohol is certainly responsible for many cases of heart disease.

To sum up the etiology of organic valvular disease of the heart: We have rheumatism, scarlet fever, and along with scarlet fever may be mentioned pneumonia, diphtheria and several of the other infectious diseases, then occupations, athletics, log-rolling, etc., then syphilis, and finally the use of alcohol.

What can be said of a combination of these causes? We believe it can be truthfully stated that where there exists a combination of two or more of the causative factors mentioned, the development of organic heart disease sooner or later is rendered more likely than when but one cause is in evidence; at all events this appears to be true of all the causes except rheumatism. We know that rheumatism will sometimes produce heart disease secondarily no matter what is done, no matter what kind of a case you have to deal with, no matter what may be done in attempting to prevent or forestall it! Let me repeat, some time during the life of the patient there may develop well-marked heart disease in spite of everything! There can be no doubt that the combination between occupation (log-rollers, athletes, etc.) and the use of alcohol, and incidentally syphilis, will make a trifold causation which will be very likely to result in some trouble with the heart.

We do not know positively in the case before us what caused the heart disease, nor does it seem possible for us to ascertain. This woman tells us that she has always been a hard worker, still she does not come under the head of athletes, log-rollers, or occupations that require unusual strain on the heart. However, she tells us that when a girl eight or ten years of age, she used to carry large buckets of water a distance of two miles which taxed her strength almost beyond endurance. It may be possible that this had something to do with causation of the heart disease from

which she now suffers, and it would have appeared as dilatation accompanied by compensatory hypertrophy.

We cannot even claim in this case that the pneumonia or typhoid fever was the direct cause of the condition which we now find present. Pneumonia attacks the heart, but not in the same way as does rheumatism or syphilis. When pneumonia affects the heart it is usually in the form known as acute or chronic ulcerative endocarditis and generally results in rapid dissolution. But this woman tells us that before she had this attack of pneumonia and typhoid fever,—whether it was pneumonia with the typhoid state following as previously remarked, or whether it was typhoid fever complicated by pneumonia, we are unable to determine,—she had some evidences of heart trouble, at least we are led to infer from her statement that the heart disease antedates the severe illness mentioned. In this connection, however, we must remember the point made by the patient herself, *viz.*, that she suffered a severe attack of illness (either pneumonia or typhoid fever), and if there existed previous to that, any disease of the heart, it is certainly wonderful that she lived, because when we have either pneumonia or typhoid fever and a crippled heart to start with, we would not ordinarily expect a favorable outcome; the chances of recovery would be extremely remote!

The patient says she has never suffered with cough, so the pulmonary circulation is good and the lungs are not congested. There has been no swelling of the feet or hands, she has had no oedema because of failure of the circulation; there has been no accumulation of fluid in the serous sacs of the body; in other words, compensation has been perfect up to this time. Whatever leakage there is at the valves has been more than compensated for, or overcome, by the increased strength or hypertrophy of the heart. This we may infer because we observe that there is no swelling of the hands, face or feet, and she says there has been none at any time. Indeed to look at her one would not suspect that she had any serious heart involvement. She says her bowels are regular, appetite fairly good, but she has some indigestion.

There is one curious thing in connection with disease of the heart, *i.e.*, we may have a badly crippled heart sometimes and never be able to recognize it from the character of the pulse with-

out the use of the sphygmograph. I doubt very much if there is anything in the character of this woman's pulse that would suggest heart disease to anybody. Her pulse is perfectly regular now, it may be intermittent at other times, or it may be irregular as to rhythm, it is 85 or 90 to the minute, not very strong, but there is not a feature in connection with it that would point to any serious heart lesion; and I have noticed that many times with reference to valvular disease of the heart, *i.e.*, placing the finger over the radial artery would disclose nothing in connection with the pulse to indicate or suggest the existence of heart disease.

I shall have very little to say with respect to the ordinary symptoms of organic heart disease: We will examine for the physical signs and see if we can locate the point at which the lesion exists, and tell you exactly what it is. By inspection we learn only that the apex beat is displaced, that it is further around to the left than it should be. Of course the apex beat might be displaced by the heart being pushed to one side or the other, or something might cause it to be pulled over toward the left side further than normal, such for instance as a previous attack of pleurisy; chronic adhesions from a pleuritic attack would bring about the same result. These are two of the means by which the apex beat may be displaced, but the more common explanation is hypertrophy of the heart, and that is the cause of the displaced apex beat in this case. The patient tells us she has never had an attack of pleurisy. However, it must not be forgotten that pneumonia with pleurisy might produce the same result by pulling the heart over to the left. This occasionally happens, but it is by no means common. By inspection, then, we simply observe that the apex beat of the heart is displaced.

By palpation, which is a very important method of studying heart disease, and I would urge upon you never to neglect it, we learn more than by inspection: whenever there is a bruit, a thrill, it can easily be detected by palpation, as any unusual impression is readily transmitted through the chest wall. You will find that you can frequently diagnosticate the character of heart disease with which you have to deal by palpation alone. We learn in this case by palpation that the heart is beating with unusual force, the impression imparted to the fingers is that the apex beat

especially is unusually strong and hard, yet there is no thrill, and there is nothing so far detected to make me suspect that we have a murmur. The only thing I would infer from palpation is that there is an enlarged heart, because the apex beat is displaced to the left, confirming the information obtained by inspection.

The next step in our examination is the most difficult, *i.e.*, percussion: As I have reminded you on former occasions percussing the heart and making an outline of it is not the easiest thing you will encounter in the practice of physical diagnosis, and this is particularly true in fat subjects. Of course where the heart is hypertrophied, we expect to find it very much larger than normal, and we ought to be able to show that it is enlarged by outlining the cardiac dulness. Without going further with percussion you can see enough from the extent of the irregular line of dulness we have mapped out to be certain that the heart is considerably enlarged. We have simply confirmed what we have already learned by inspection and palpation.

In our percussion it is important that we make the differential diagnosis between simple hypertrophy and hydropericardium. In simple hypertrophy you have the presence of a dull area, triangular in shape just as it is with a normal heart, the base of the triangle being upward, the apex of the triangle corresponding to the apex beat of the heart, the only difference being that the triangle is larger. If hydropericardium exists you may have the same triangular shape, but the apex of the triangle will be upward toward the base of the heart, and the large end of the triangle will point downward, because the fluid sinks to the lowest level.

By stethoscopic examination we find an unusually interesting condition of things: There is a very loud murmur heard with the first sound of the heart, which is transmitted upward making it a direct aortic murmur; a little further down we hear a double murmur, a blowing sound coming and going exactly like the puffing of a steam engine, which we conclude is a bellows murmur of the aortic valve; over the mitral orifice and at the apex we get a murmur heard with the first sound of the heart, which is transmitted into the axilla and under the left scapula; this is the mitral regurgitant murmur. So there are three distinct murmurs

in this case, (1) aortic direct, (2) aortic indirect, and (3) mitral regurgitant.

We have easily arrived at our diagnosis in this case, but the etiology is very uncertain: We do not know what caused the valvular lesions, the trouble may have originated when the patient was a child from carrying heavy weights as she has told us. It certainly would be within the bounds of reason to attribute the present trouble to the fact that while she was a delicate young girl she had to carry four to six gallons of water in buckets for a couple of miles, there is no question that this would exert an unusual strain upon the heart. This brings us in the history to the point where she had a serious attack of illness, but here the insurmountable difficulty presents itself that we mentioned previously, *viz.*: if this woman had any heart trouble at the time she suffered the attack of pneumonia or typhoid fever she would almost certainly have succumbed at once! We cannot go far enough into the history, therefore, to say positively what was the primary condition which induced the heart disease we now find present. It is fair to say that cases are encountered now and then where we are absolutely unable to ascertain on diligent inquiry any history of pre-existing disease which might account for the development of the organic heart lesion. There are cases which cannot be explained in that way, though the overwhelming majority will have the history of rheumatism or some other causative factor antedating the heart involvement. There is leakage at both the mitral and aortic valves, and these are the two valves most commonly involved, the mitral first of all and the aortic next.

As to the prognosis in this case: To look at this woman one would not think she was sick, she does not look ill, she could not get life insurance, and yet she may live a long time. Many a man goes through life walking on a lame leg, he is able to get about fairly well, of course not as good a man as if he had two sound legs, but he lives; many a man lives thirty or forty years with a crippled heart.

Another thing about heart disease which it is very important to bear in mind is, it is not always the delicate looking individual suffering with heart disease that dies promptly, such patients often live for a long time; it is not always the loud murmurs that are

necessarily the most dangerous: the barking dog does not always bite!

So the prognosis here as far as we can see with reference to life is fairly good, there is no reason to believe that this woman will not live quite a while, perhaps for many years. There is this, however, to be said about the case, she will never be well of the heart disease. She is like the man with the lame leg, she will go through the balance of her life with this crippled heart, just as the man goes through life with his crippled leg, though she may live for twenty or thirty years. She is now thirty-eight, and she may live to be seventy, we cannot tell. The danger she will have to contend with is this, the development of some intercurrent disease, an attack of pneumonia would now in all probability promptly close the scene, in fact should she suffer any serious illness she would be greatly embarrassed because of the condition of her heart. That is one contingency, another is that, sooner or later the heart will reach the point where no further hypertrophy can take place, there will be no further compensatory enlargement, leakage through the valves will continue, and as there will be no compensation, she will begin to have swelling of the hands and feet, puffiness about the eyes; there will be symptoms of accumulated fluid in the peritoneal cavity, in the pleuræ and the pericardial cavity; she will have more or less congestion of the lungs and consequently cough will become an annoying symptom; she will have more or less disturbance of the digestion because of faulty circulation of blood through the digestive organs; she will be likely to have kidney involvement, Bright's disease may develop, because of imperfect circulation of blood through the kidneys. That is the outlook, the prognosis, in a case of this kind, still the fact remains that the patient may live for years and remain in reasonably good general health. There is this to be borne in mind, the belief among the laity and also the impression among many doctors, that whenever persons have heart disease they are likely to drop off suddenly. As a matter of fact the majority of people who have valvular heart disease do not die suddenly.

As to the management of cases like the one before us: I hope it will never be said of a man who goes out from this University that because he finds a heart murmur present he immediately

gives digitalis or strychnine! Why should we give this woman any such medicine? If she had interrupted compensation as evidenced by swelling of the feet and legs, or if she had congestion of the lungs with consequent cough and a great deal of shortness of breath, or if she had an accumulation of fluid in the peritoneal or the pleural cavity, then digitalis would probably be a good remedy and ought to be administered. The real and prime indication for use of digitalis in organic heart disease is when there is interrupted compensation, then it may be administered to advantage. Under other circumstances it is often worse than useless, it does more harm than good. This woman would not be in the least benefited by the use of digitalis, and the same may be said of strychnine. It is a very common practice among certain doctors whenever there is a symptom referable to the heart to administer strychnine. As you know this drug simply adds force to the muscular power of the heart, it is a muscular stimulant, it merely stimulates the heart to greater muscular action. As long as this patient has no irregularity of the pulse, as long as she has no œdema, as long as she is getting along well, why should we give her strychnine? Whiskey and all the other so-called heart stimulants, heart remedies, are likewise not called for, and there is no excuse whatever for giving them.

You may ask, then, what are we to do for a case of this kind? We will treat this woman by not giving her any medicine whatsoever. She does not need any medicine, she simply needs to be advised as to her method of living; she should be instructed to lead a life that will put the least possible strain on the heart, our aim being to hold the hypertrophy of the heart where it is, not make it increase any faster than it will naturally. This means, of course, that she should lead a regular life; she should live an out door life, getting all the good pure air that she can; she should partake of a diet that will tax the system the least, that is, she should have plenty of good nourishing food; she should take nothing that will have a tendency to disturb her digestion; she should look after the emunctories of her body carefully; the skin ought to be protected from chilling; she should keep the skin clean so that its action will be free; the bowels must be kept open and free, not necessarily purged, but she should keep them

carefully regulated; the kidneys particularly should be looked after, and if there is any evidence of sluggish or slow action on part of these organs, then they might be stimulated with some of the simple diuretics.

To sum up the management: Nothing is at present indicated in the way of treatment except good hygiene, and good regular, orderly methods of living. When we see evidence of interrupted or broken compensation, then it will be time enough to administer medicines which are distinctly known as heart remedies, but not until then!

PAIN AS THE CHIEF OR SOLE EXPRESSION OF A PSYCHIC STATE; WITH ILLUSTRATIVE CASES *

BY THEODORE DILLER, M.D.

of Pittsburgh, Pa.

Neurologist to the Allegheny General and Columbia Hospitals; Visiting
Physician to the Psychopathic Department of the St. Francis Hospital;
Consulting Neurologist to the Mercy and the Pittsburgh Hospitals

PAIN of severe character, intermittent, remittent, constant, or paroxysmal, dating back over a period of many months or many years, is sometimes complained of by patients as the chief or only symptom from which they suffer. Such pains often are extremely puzzling to the physician, and patients who suffer from them very commonly go from physician to physician seeking aid; and some of them are operated upon repeatedly by surgeons acting upon various theories. Such pains, I am firmly convinced, may constitute the expression of a morbid psychic state. Whether we call such pains hysterical or not does not particularly matter, but that they originate in the mind of the patient, and not in the knee, or abdomen, or back to which they are referred is the principal thesis of this paper.

I am fully alive to the fact that one may commit grave error in diagnosing a pain as psychic in character when it may be really due to organic disease. I am also quite well aware that an organic disease in a nervous individual may give rise to certain hysterical expressions and that because we find some hysterical manifestations in a patient we are not, without caution, justified in concluding that he suffers from no organic disease. But nevertheless the problem must be squarely faced.

I am bringing forward for your consideration a series of severe, stubborn, obstinate instances of pain all of which have been regarded by some physicians or surgeons as due to some organic disease, and all of which I look upon as instances of psychic pain,

* A paper read before the McKeesport Medical Society, January 31, 1908.

pain due to an idea, a mental operation. I must admit that perhaps I may have been mistaken in my conclusion regarding some of these cases I am relating and that not all were examined with sufficient thoroughness; yet these diagnoses seem to me probable in all these cases; and in two or three of them I feel that it can be made with reasonable certainty.

How may psychic or hysterical pain be recognized? By two kinds of evidence, the negative and the positive.

First the negative. The pain fails to conform to that of any one organic disease, and seems too contradictory in its character, time, appearance, duration and in many other features to indicate organic disease. The failure to discover any physical disease after painstaking efforts is important evidence. But this evidence is not enough. As to the positive evidence, one of the most important points is the influence of suggestion upon the pain. Another important evidence is the manner in which the patient relates the story and conducts himself, and the manner in which the pain is described and complained of. The story is told with great detail and with many dramatic accessories showing that the patient's whole life centres chiefly about his pain and the dramatic incidents connected therewith. The expressions of pain are immoderate in character. In some cases the pain is discovered to be a skin pain.

These are, to be sure, but very few outlines in arriving at a diagnosis, but I feel that they are of value. Here, as elsewhere when confronted with diagnostic difficulties, one must bring to bear such evidence and such reasoning as his training may enable him to employ. Finally I must say that there is a certain impression communicated to the physician by the story and the manner of these patients which cannot be stated adequately in words; and this is true, to be sure, of many diseases other than hysteria.

Without further introduction, I will now bring forward for your consideration a number of clinical cases which I have labelled with more or less confidence as cases of psychic pain.

I suppose it has occurred a good many times within the experience of every surgeon that patients have complained disproportionately or extravagantly of various pains from which they may have suffered, and that others have continued to complain of pain after the inflammatory state or other lesion which gave rise to the

pain had subsided or been removed. I shall relate a case under my observation at present which probably belongs to this category.

The case is that of a woman, aged 44 years, who has been married seven years. As a little child, and for a long time, it was feared she could not be raised. She was a very nervous child and springs from neurotic ancestry. It is likely that over-indulgence of her kind parents also helped to lay the foundation of her subsequent troubles. She is the mother of one child, a girl aged six, who is thin, delicate, nervous, very apt and clever.

The patient's present illness began in 1884. At that time her left knee was injured by a fall from a carriage. She was barely able to walk during the next few days following the accident. There was considerable swelling of the knee. She was confined to bed for a short time. She finally recovered, and could walk as well as ever and forgot all about the knee. One day while dancing she fainted; and upon reviving she felt great pain in the knee. Now an operation was performed on the knee and the patient said much pus was let out. (?) There was great pain in the knee and she was compelled to walk on crutches. Finally after several months she abandoned the crutches, and was able to walk four or five miles a day. Her physician felt that the pain at this time was not in the knee-joint but was due to a periostitis below the knee. (?) In June, 1890, the patient suffered a fall; her right knee struck the ground. She suffered a great deal of pain in this knee after the accident and was compelled to walk on crutches which she was not able to abandon until six months later. Several months later while "in perfect health" she suffered a sudden pain in the right knee. She says the knee felt hot and burning and she could bear no weight on it. She was laid up for a year. She was very nervous and tells in detail of much trembling of the stomach and other nervousness from which she suffered. In 1893 she was put upon a rest cure by Dr. Weir Mitchel for a period of two months. She improved greatly. She now felt pretty well; but the right knee would pain her when she became tired. In 1895 the pain returned with great suddenness to the right knee and she said that she has suffered from much pain in the right knee ever since. She now consulted a surgeon and was under his care for two months. She states that the pain in the right knee was a "hot pain." She went South

for her health. On her return she was under the care of another surgeon for a period of two months in the spring of 1896. She had been compelled to use crutches all the previous winter. In the spring of 1897 she threw her crutches away while out in Colorado. Here she could walk very well. But one day the pain returned to the right knee with great suddenness. She was again unable to walk. She returned home in 1899; and again she was walking on crutches and suffering from pain in the right knee. She was in a local hospital for three months. In August, 1899, she went to a sanatorium where she remained nearly a year. Both knees were painful, the right more than the left. She suffered much from nervousness, insomnia, and tire. The treatment at the sanatorium consisted in baths, massage, education in walking, etc. She counted her steps day by day and was able finally to make as many as 700 in a single walk. She returned home in July, 1900. She was now able to walk pretty well and was free from pain. She was married in December, 1900. Just previous to her marriage, while preparing her trousseau, the pain in the knee suddenly returned; but it was not severe enough to prevent her marriage. For some time after her marriage she felt pretty well. Her first and only child came 18 months after her marriage. Three years later she suffered a miscarriage; and she said she has never been very strong since that time. Last summer she submitted to an operation for curetting the womb, and she said that she felt better afterwards than she had for 12 years. At this time she was living out West with her husband. She had a horse and did a great deal of driving. Last fall she felt very tired and languid. She stated that both knees swelled (?) above the knee-caps. She was now in constant pain and unable to sleep. She came East, October 3rd, and after she had been here three weeks all pain left her. She was advised to walk; but she stated that this effort pained the knee and she believed that rubbing made it worse.

In two of her "pain attacks" the patient's knee was put up in plaster of Paris.

The patient recited her history in great minuteness, not forgetting, apparently, any of the smallest details. Although this account of her case is rather long it is very much reduced or

abridged from that which the patient related. I have not recorded all the "pain attacks" which came to her, but only the chief ones.

The patient's family physician is quite sure that there has been no redness or swelling of the knees in many years. He believes there was some swelling in the beginning and he looks upon her case as one of traumatic hysteria, holding that psychic pains followed pains due to a real traumatism.

Whether or not there was any organic change in the knees at any time (of which I am doubtful) it does seem that an accident was the provoking cause of this long series of pain attacks which began 23 years ago. Certainly this much seems clear now that the "pain attacks" referred to the knee of which the patient has suffered have not been in many years, at least, referable to organic changes. The great suddenness of the onset of the pains and their sure relationship to tire, the presence of many neurasthenic symptoms, the neurotic character of the patient, her introspective mental state, with her long detailed account of her illness all argue for the psychic character of the pain at the present time.

I plainly told the patient that her pains were mental in character, coming under the general head of what is known to physicians as hysteria; and then I took pains to explain to her what was meant by hysterical pain as physicians understand it. I placed her in the hospital on the rest treatment and with the idea of educating her in a mental and physical way, but chiefly to have her accept and act upon the idea that her knee pains were psychic in character and assist her in combating them in a psychic way. The patient, in the language of her family physician is "Up in the attic or down in the cellar." She is a bright, clever woman whose company is very agreeable and who greatly overtaxes herself in a mental and physical way when she feels well. I have warned her against overexhaustion, mental or physical, and urged her to ignore her pains more and more and to depend upon herself more and more. I regard it as of the greatest importance that this patient should keep within the limits of her powers, and especially guard herself from overtaxing herself when she feels well. In short I feel she must be *educated* out of her present state if she is to get well. She improved considerably on the rest treatment.

On December 5, 1905, I was consulted by a man, aged 25 years,

who had previously consulted fifty doctors and had been operated upon by surgeons several times, on account of paroxysmal pain in the lower left abdomen. The patient is a married man, 25 years of age, father of two children, and a barkeeper by occupation, working for his father, who is the proprietor of a saloon. He does not drink and uses but little tobacco.

In 1899 one testicle was removed on account of injury. He made a good recovery from this operation and married two years later, 1901, *i.e.*, six years ago. Eight months later his present trouble began,—pain attacks referred to the left lower abdomen. The attacks of pain came at intervals of five or six weeks when he would lose a day or two from work on account of them. They grew more and more frequent. An X-ray examination showed nothing abnormal. In 1902, he was operated upon by a surgeon for the removal of the left kidney which was believed to be the seat of the trouble. But the kidney was discovered to be normal at the operation and it was consequently not removed. This operation was from behind as indicated by a scar. A few months later he was operated by an abdominal incision. In 1903 his appendix was removed. A few months after this operation another surgeon operated, exploring the abdomen, and removing two adhesions. After this last operation the patient went to Cambridge Springs, where he gained 10 pounds and was free from pain for five or six weeks. *The patient states that after every operation he has been free from pain for a longer period than usual.*

He observes that pain seems to keep away when he is not at work and returns when he goes to work. He also revealed to me that his father is "peculiar" and "expects a great deal" from him. He observed, "The least thing said to me hurts my feelings. I will think of it and talk of it for two or three days."

All attacks of pain are alike in character, differing only in severity. Between the attacks he is as well as ever; he eats well and sleeps well.

An attack begins gradually by pain in the abdomen in the nipple line, at the level of the crest of the ilium. This painful area can be covered by two fingers,—it never spreads. The pain, after beginning, increases steadily in severity and reaches its maximum in two or three hours. When the pain is at its height he

often rolls, tosses, and writhes about the bed and holloes aloud—"that is when I let it go too long," he adds. With the pain he generally gets sick at the stomach. The pain attacks pass away as gradually as they come. In every bad attack a neighboring physician has been summoned and he has had a hypodermic injection of morphine. At the height of an attack, he presses the abdomen deeply at the seat of the pain. The intervals between the attacks, however, are not fixed, but are on the contrary quite variable. He has had two attacks in a single day.

Of late, the attacks have been occurring at intervals of two or three weeks. As stated before, they occur less frequently when the patient is not at work. He states that when pain has come on while at work he has "held out" seven or eight hours—staved off or postponed the pain—to go home and find it greatly increased.

Often he has had a premonition of a "pain attack" by a general feeling of sickness (malaise) before an attack.

Between the attacks, as stated before, the patient is well. But he states that he does not like to work as much as he should and is tired in the morning and "don't like to get up in the morning as I ought to."

Examination.—The patient is a rather slender young man, weighing 117 pounds. He tells his story with most time-consuming detail and is evidently greatly impressed with the idea that his case is a very remarkable one and that by reason of the pain and the numerous operations to which he has submitted he is very much of a martyr and a person of considerable distinction. He evidently derives great satisfaction from the recital of his long story. The several scars on his body bear witness to the truth of the patient's statement as to the various operations which he states he has undergone. The patient impressed me as a weakling in character.

I recommended isolation at the hospital with the rest cure. The patient, after consulting his father, declined to submit to this treatment. I think it did not appeal to them as being heroic or definite enough. I lost sight of him, much to my regret; for I was very anxious to observe him in some of the pain attacks and try the value of apomorphine hypodermics as pain arrestors.

I recently learned that a new surgical operation had been performed, about 18 months after I saw the patient, this time a cir-

omcission, and that many close adhesions had been found and broken up; and since this operation the patient had been entirely free from pain.¹

This last operation, to be sure, does not throw much light on the situation (although the operation itself appears as indicated) since the patient has always been free from pain for a considerable length of time following *any* surgical operation. The surgical operation makes him a dramatic figure; and this he seems to love. He really seems to like surgical operations; and he seems to be thoroughly impressed with the idea that he must look to surgery and to surgery only for relief.

The next case is that of a single woman, 22 years of age, a milliner by occupation. She has been in poor health since early childhood. She was early subject to headaches and has worn glasses since she was eight years of age. Four years ago she was again fitted for glasses because of headaches. She had been more or less troubled with digestive derangements. She had had frequent vomiting attacks. Two years ago her stomach was washed out; since that time she has had no trouble. Her headaches have always been located on the right side of the head—in the forehead and temporal region.

The patient developed very early; her menses began at 13. At 15 she had grown so large that she was ashamed to go to school.

For the past 2½ years, she has been troubled with a constant pain in the epigastric region and with a headache located on the right side, but which moves from there to the left side. She has no digestive disturbance now; she always sleeps well; her appetite is good and her bowels regular.

The general appearance of the patient is good. She appears as a large, well-developed girl. She accomplishes her work readily.

The spot of tenderness is located to the left of the epigastrium and is 1 by 3 inches in area, and extends over the border of the ribs. The patient states she has *never* been free from pain in this region during the last 2½ years. Pressure over it causes pain. Examination also discovered a spot of tenderness over the lower

¹ I have since learned from the surgeon who operated on him last that the pain has returned.

sacrum which is painful to pressure and of which the patient was unaware.

Examination of the various organs of the body was entirely negative. The patient appears as a stout, healthy girl. She was evidently much self-centred with regard to the painful area. Like the other patients she had consulted a number of physicians regarding this pain. I formed the opinion that the pain was, in all probability, psychic in character. Occurring in a girl who presented much evidence of nervous instability in her previous history, the long duration of the pain, its local character, its persistence, and its non-relationship to the ingestion of food, together with the patient's evident neurotic character and the fact that her whole mental life seemed to centre in the pain, were the chief points which led me to the conclusion that the pain was probably psychic in character.

A few years ago, I saw a young Hebrew man 20 years of age, a student, who since the age of 14 or 15 had complained of a pain at the margin of the ribs, on the right side in the nipple line. The painful area was about the size of a dollar and fan-shaped. Examination of the abdominal viscera and careful questioning revealed no signs or symptoms aside from the pain. At first intermittent, the patient said the pain has now become constant and that there are very severe exacerbations. It has been growing steadily worse during the last 4 or 5 years. The patient also complains of a spot of tenderness the size of a silver quarter, located in the right lumbar region. The tenderness is constantly present here, but it radiates from this centre over the entire right side of the body, being in this respect different from the pain located at the margin of the ribs, which does not radiate. The patient is a robust, stocky looking boy. He states that he has no appetite; but it appears, on his mother's evidence, that he eats very well. Lately he had slept poorly; he states he has often "wakened up in the morning crippled from pain." If once he gets to sleep he does not waken by reason of the pain. Movement increases the pain. His mother notes that the pain troubles him very little when he is in the midst of jolly companions.

The boy had been to some 10 doctors, among them some of the best-known members of the profession in the eastern cities. He

commented in a very cynical and indeed rude manner as to the disagreements among the physicians he had consulted; and he comes to me against his will and with no hope that I can relieve him.

It appears that the boy has been greatly indulged at home. He has never complained of anything aside from this pain; and no other signs or symptoms of disease have ever presented themselves.

The examination of the patient was negative in every way. He appears as a healthy boy; he presents no evidence of disease whatever. Pressure over the spot of tenderness causes no pain.

I saw this patient but twice, and, therefore, did not have an opportunity of studying him as fully as I should have liked; and yet I feel convinced that the pain of which he complained was psychic in character; and for the same reason adduced for the other cases in this series.

On February 22, 1905, I was consulted by a man 61 years of age, who had suffered from a pain in the right lumbar region, three inches to the right of the nipple line on a level with the crest of the ilium, for the past 12 years. The patient located the pain exactly; and its area was about that of a half dollar. He stated that it was constantly present without intermission. There are severe exacerbations; but on the whole it is steadily increasing in severity. At first the pain did not interfere with his sleep, but latterly it has done so. The patient stated that there had been no discoloration, or jaundice, or palpable or visible tumor at any time. He has consulted a great many physicians, among others Dr. Porter, of New York, and Dr. Osler, of Baltimore. He stated that at no time did pressure over the seat of the pain increase it. Riding in a rough wagon or jolting of any kind had no effect in increasing the pain. Cold and hot applications sometimes relieve it. The pain varies much in intensity. Exacerbations and remissions are frequent and often very sudden. The sudden raising of the right arm will often start the pain. It may disappear suddenly, as when he lies down. He has often been awakened out of sleep by the pain. Liniments never relieve him. The pain never radiates from its seat and as stated before it is always in the same place and its area can be covered with a half dollar.

The patient is a farmer by occupation, a veteran of the Civil War. His family history is good; his personal habits are excellent, and he has never suffered from any serious disease. He has a baby four months old.

The patient tells his story with very elaborate detail. Occasionally during the recital he doubled up with pain, but did not stop talking. He gives evidence that he has been in contact with many physicians by his discussions of his own case. He has been frequently assured that he suffers from no organic disease and he discusses rather glibly the questions of disease of the gall-bladder and the stomach and talks a good deal of "excluding" this, that, and the other disease, *e.g.*, gall-stones, kidney disease, stomach disease, etc. He consulted me of his own volition, reasoning that since the various organic diseases may be "excluded," his trouble may be nervous in character.

The patient's general appearance is good for a man of his age. His weight is 146 pounds; there is marked arteriosclerosis; the knee-jerks are greatly exaggerated; the pupils are small, 1.5 to 2.0 mm. They do not react to light. There is great loss of cutaneous pain sensation everywhere, more marked on the right than on the left side of the body; it is absent over parts of the right side. Pressure over the painful region produces no increase of pain.

The patient was isolated in the Allegheny General Hospital. Physical examination of the abdominal organs was negative. The urine and blood were found to be normal. Feeling that the examination should be as thorough as possible, I invited an internist and a surgeon, Drs. J. A. Lichty and O. C. Gaub, to examine the patient. The latter could find no evidence of disease. Dr. Lichty's examination resulted in the discovery of a degree of hyperchlorhydria; and the patient was put upon a diet advised by him, with a view of correcting it. At the same time, a plan of psychotherapy was inaugurated. It was suggested to the patient that as the pain was mental in character, a realization of this fact would help him very much to throw it off. Encouragement, persuasion, and occasionally scolding were all employed. At the hospital the patient slept only three hours at night. Several times during each day he groaned and cried aloud; often he could be heard quite a distance from his room much to the annoyance of the other patients nearby.

He insisted that his business operations were of such importance that it was necessary that he should receive his mail daily. Some 8 or 10 letters arrived every morning. Whenever they were delivered to him he at once gave them his attention. (He was a careful and successful business man.) On a number of occasions a groaning spell was immediately cut short by the arrival of the letters. In his groaning, the patient would lean forward and double up in bed and screw his face into an expression of great pain.

The small pupils together with the pain made me think that the patient was perhaps a morphine eater. Careful inquiry of the patient and his friends failed to substantiate this suspicion. The friends felt quite sure he was not a morphine eater. The patient's attention could be readily diverted in the midst of a pain attack by scolding, threatening, or as mentioned before, the delivery of the morning mail. His appetite was good and he ate anything. When placed upon the special diet by Dr. Lichty, he made no objection and took it as readily as he had the regular hospital diet. The patient after five weeks' stay in the hospital left it unimproved. A few weeks later he wrote me that he felt somewhat improved since his return home.

I had a long talk with two of his brothers during his stay at the hospital and their observations of him led them to believe that the pain was on a mental basis. They stated that the pain was the patient's chief and most absorbing topic of conversation, that he discussed it with anybody and everybody; and that his frequent visits to physicians for the relief of the pain had become a mania. The patient had been for many years an incessant worker, very shrewd in business operations and had accumulated a very considerable fortune.

Reviewing the case there is to be noted as suggestive of organic disease the exaggerated knee-jerks and the small pupils which do not react to light and the hyperchlorhydria. Suggestive of functional disease we have the whole history of the case, the marked influence of suggestion, and the loss of pain sensation and the local character of the pain and the exaggerated expressions of it and the centring of the patient's mental life around the pain.

I believe that the pain was psychic in character. I think there is no organic disease which is capable of producing the physical

pain in the abdomen the size of a half dollar, continuing over 12 years and producing no other symptom referable to the abdomen. The patient's exaggerated complaints at times and the fact that the pain was frequently influenced by suggestion together with the loss of pain sensation and the mental attitude led me to this conclusion. As to the evidence of organic disease, I do not believe that the pain could be referred to the hyperchlorhydria; for it was wholly unrelated to the digestion of food and not of the character encountered in this disease. The arteriosclerosis was not greater than it is often seen at the patient's age and the exaggerated knee-jerks are often seen in hysteria. Even if some organic disease existed in this patient, I cannot believe it sufficient to explain this one symptom which possesses his whole life.

Pains of various sorts are often seen in the psycho-asthenic individuals, and sometimes form an important part of the clinical picture, but seldom do they dominate it as in the case which I have just described.

It is hoped that the recital of these cases may serve to draw attention to the great importance of pain as a psychic expression in various conditions. Its non-recognition has often led to barren therapeutic efforts, to wrecked lives and social tragedies. Even when we cannot cure the patient, we can often be of immense help to the well members of the patient's family,—a most important part of the physician's duty,—by acquainting them with the true character of these psychic pains.

SOME CURIOSITIES OF LEAD POISONING

BY JAMES J. WALSH, M.D., Ph.D., LL.D.

Acting Dean and Professor of Nervous Diseases and of the History of
Medicine, Fordham University School of Medicine, N. Y. City

SOME years ago the American medical public, or at least that portion of it which attends medical meetings and reads medical journals, was rather startled to be informed, as the result of the careful collection of the statistics of the cases treated at Johns Hopkins Hospital for something more than a decade, that gout was not nearly so infrequent in this country as had been usually supposed, and that especially by comparison with England which is ordinarily proclaimed to be the particular and peculiar home of gout, in the sense that it is there that one sees gout frequently, our statistics for its occurrence were not nearly so favorable as we had been accustomed complacently to think. It would very probably be presumed by most American physicians that gout was at least three or four times more frequent in England than in America. The statistics of Johns Hopkins showed that taking into account the proportionately larger number of admissions of all cases into the London hospital, for every three patients suffering from gout admitted to the Baltimore institution, only four cases were admitted into St. Bartholomew's Hospital in the English metropolis, which is usually considered, since it is situated in the populous poor district of the East End of the city to have under treatment about as high a proportion of these cases as any hospital in Great Britain.

Another interesting feature of the Johns Hopkins statistics was that most of the gout in this country proved to be earned, not inherited. Heredity does not play nearly so important a rôle in the origin of all diseases as used to be thought and even from what was considered to be its veriest strongholds—tuberculosis and gout—it is being excluded by slow but sure degrees. Most of the Baltimore patients had secured for themselves the privilege of being troubled by this bothersome disease by certain habits of life and by certain occupations. One-third of all the cases were found

to be clearly traceable to the frequent and rather abundant use of malt-liquors. About another third was found to occur among those who were much in contact with lead. In only the remaining third was the influence of heredity apparently traceable, and even in these doubtless there were other factors which played an important part. It has long been known that there is no appreciable pathological difference between the kidney of gout and that of chronic lead poisoning, and the suspicion that lead was the principal causative factor in other manifestations of gout has long been entertained. It is not alone painters, however, who are likely to suffer from the disease, though because of the somewhat unfortunate term "painters' colic" many persons think of the possibility of lead poisoning as an occupation-disease likely to occur in connection solely with the painters' trade. Plumbers, typesetters, stereotypers, and people who handle lead habitually even to a less marked degree than these may and frequently do suffer from lead poisoning.

The whole subject of lead poisoning has taken on a decidedly added interest because of these observations, and as a consequence many more cases of the affection are reported than formerly. Mild forms of plumbism have heretofore very often escaped notice, and have gone to swell the number of so-called autointoxications, or the still more vague idiopathic diseases. It is very evident that, as is true of so many other forms of intoxication, susceptibility plays a large rôle in the development of the disease. Some individuals are intensely susceptible to the influence of lead on their system. Others seem to stand considerable quantities of it with impunity. It is these latter particularly who are unfortunate since they develop the serious chronic effects of lead poisoning, while the others with more susceptibility are not able to continue their work in connection with the metal because of the acute symptoms which develop as a consequence of contact with it. This rôle of susceptibility to a poison as a valuable safeguard against it and as an eminently conservative factor in life, is usually not realized as it should be. The explanation of it to patients is always a source of encouragement, for they are usually accustomed to think of themselves as peculiarly unfortunate. The case is just the other

way about. Susceptibility like sensitiveness to pain is a valuable conservative factor in life.

Very special susceptibility to the influence of lead is illustrated by the following cases. They are probably not unique of their kind, but in them the signs of plumbism were so latent that in some instances the actual cause of the trouble escaped the observation of careful physicians, for some time at least, and it required a good deal of care before other possible syndromes were eliminated and the true etiological factor recognized—lead intoxication. The first case that I have to describe illustrates very probably, not so much an extreme susceptibility to the toxic influence of the metal, as the unusual source from which the lead was eventually accumulated, though in minute amounts yet sufficient to give rise to very marked symptoms. It emphasizes the necessity for careful investigation of all the details of eating and drinking in cases where there may be a possible suspicion of the presence of lead poisoning.

The patient was a young man twenty-seven years of age, a relative by marriage, whose history therefore I was in an exceptional position to obtain completely, and who presented the ordinary symptoms of double wrist-drop. The occurrence of paralysis in the case had been preceded by a somewhat prolonged period—several months—of discomfort, in which the forearms became easily fatigued and were rather painful if much work was done in damp weather. This had led to the diagnosis of rheumatism. The diagnosis of rheumatism automatically calls up the prescription of the salicylates so he was loaded down with this drug. The salicylates had given temporary relief from the discomfort, as any coal-tar product, even the much-abused acetanilid, would have done but, almost needless to say, the salicylates had not lessened his sense of fatigue which continued to increase rather than to grow better. After a time his wrists began to drop, and later he lost power completely in his hands. The previous history somehow fostered the idea of rheumatism, and accordingly it was considered that he was suffering from some of the curious sequelæ of one of the vague chronic forms of rheumatism that haunt certain minds like spectres, since they are supposed to make patients absolutely helpless.

It was while he was in this condition that I first saw him. There seemed to be no possible clue to lead poisoning in his case. He was a bartender but absolutely never touched liquor, or any form of intoxicating beverage. He was literally an absolute abstainer. In his position he was frequently "treated," and, as he did not want to take cigars, because it might be thought that these would afterwards find their way back into the box again, he frequently drank what he called "soft stuff" or temperance drinks—some of the various forms of sarsaparilla, ginger-ale or lemon soda, which are popular in country places. This was the only habit that he had. He did not take any one of these forms of drink much more than the other, though possibly ginger-ale was consumed a little more frequently than any of the others. At the moment this matter seemed to have no bearing upon his present trouble, nor indeed could anything else of importance be discovered in the history. The only direct indication that was present was the double wrist-drop which pointed to a constitutional or spinal condition, and as the most frequent cause of this is lead poisoning he was treated accordingly. He had suffered considerably from constipation and there were some complaints of colic, but the pains were not severe and were in fact only of sufficient significance to confirm to some degree the awakened suspicion of possible lead poisoning.

When placed on iodide of potassium in doses of about a dram per day and frequent purgation by means of the sulphates he promptly began to improve. For nearly a year his hands had been absolutely useless. He had seen a number of physicians, and none of them had given any relief. He had begun to look upon his case as hopeless. At the end of three months his wrist-drop had completely disappeared and his hands were as strong as ever though he was a little awkward in using them. At the end of six months not a sign remained of the serious condition that had been present, and though it is now nearly ten years since the wrist-drop first appeared there has been no recurrence of the symptom.

The question was to explain the source of the lead. For this purpose the only possible pathological incident in his history, his consumption of large quantities of soft drinks, was carefully investigated. It was found that the bottles in which the beverages

came were closed with the old-fashioned lead stoppers which were still in use in country places after they had been abandoned in the city for the much more cleanly porcelain stoppers and rubber attachments. When a certain amount of carbonic acid gas is dissolved in water this becomes a much better solvent of lead than is plain water.

One of the very probable reasons why the patient in the second case described in this paper suffered from lead poisoning was that a trace of carbonic acid gas may have been present in the water from the artesian well to the water from which the man had taken a particular fancy. This would account for the solution of much more lead than usual in the drinking water, though the quantity always remained so small that those who were not very susceptible in his household did not suffer from any ill effects.

It was the presence of the carbonic acid gas in the "soft stuff" which probably accounted for the absorption of sufficient lead to bring about the lead poisoning in the bartender's case. Ordinary customers would not take more than two or three glasses a day at the most, but he was consuming fifteen to twenty. He was, in addition, very probably extremely susceptible to lead, though his nerves were more susceptible than his digestive tract. The complete cessation of the consumption of the "soft stuff" has left him entirely free from any further symptoms and his arms have remained perfectly strong.

The second case may have a special interest in these days when the building of country houses is a rather frequent occurrence, for it serves to show apparently what an unsuspected danger there may be in new plumbing. It is now nearly ten years since details of the case were impressed upon me. The patient, a wealthy man, had completed during the springtime a new country house in which at the beginning of June he had gone to spend the summer. He had been there some two months when he began to suffer from rather obstinate constipation with a painful condition of the abdomen that sometimes was actually colicky in character. There were intermittent attacks of diarrhoea, but the trouble seemed to be dysenteric and the most prominent feature was the rather obstinate constipation. Careful treatment for this trouble did not bring any lasting measure of relief, and the reaction

after purgation or the use of a mild laxative was always accompanied by considerable pain, distinctly colicky in character, but with no localization except in an indefinite sense around the umbilicus and rather above than below. Of course appendicitis was thought of but there was absolutely no tenderness of any kind in the neighborhood of the appendix and no resistance to palpation anywhere in the right or left iliac regions.

The possible presence of a gall-stone had been thought of and even the localization of the pain more in the mid-region than anywhere else did not completely eliminate this suspicion. Gall-stone colic is not strictly limited to the region of the gall-bladder itself, and then the possibility of a very large gall-stone having worked its way into the intestines by one of those curious processes which have more often been recognized at autopsy than during life was kept constantly in mind. An abundant use of water did not relieve the condition in any way, and while the possibility of neurotic pains was constantly kept in mind, since the localization was the same as is often noted in these conditions, treatment directed to this end brought no relief.

Absolutely the only thing that attracted attention to the possibility of lead colic was the pain and the constipation. The careful examination of several gallons of urine showed the presence of a distinct amount of metallic lead. There could be no doubt at all that the man was suffering from lead poison. The question then was to discover the source of the intoxication. None of the man's habits seemed to justify in any way the thought that it was an occupation lead poisoning. The only possible explanation that could be thought of was that the patient was particularly fond of the water from an artesian well which had been sunk on his country estate, and liking the taste of this water he used it rather freely from the time that he arrived at his country-place. The water was distributed throughout the house by a system of new lead pipes. These had not as yet become coated with the insoluble salt of lead which usually forms on the inside of lead pipes after they have been used for a time, and a small amount of lead was dissolved by the water. This had proved sufficient, apparently, to produce the symptoms for lead poisoning in a man who was, as the outcome proved, extremely susceptible to the effects of the metal. None

of his family or servants drinking the same kind of water presented any symptoms of lead poisoning. There was absolutely no other origin for the lead poisoning that could be traced than this. The ordinary therapeutic measures for the relief of lead poisoning at once produced amelioration of the symptoms, and the lead pipes being replaced by cast iron pipes no further symptoms were manifested.

The third case is that of a young woman with an extreme susceptibility to lead. She came complaining of colicky pains located around and above the umbilicus, constipation, and considerable disturbance of appetite. There had been a noteworthy degree of prostration and some tendency to vomiting. These symptoms could not be referred to any indiscretion in diet for there had been none, nor to the weather which was pleasant and salubrious, and the difficulty was to find the cause for her condition. During the course of the conversation I suggested casually that she exhibited exactly the symptoms that a man, who has considerable susceptibility to lead, does when he begins to work with that metal, symptoms which he manifests very early after the adoption of an occupation which brings him in contact with the metal. The remark was made rather to illustrate how carefully one must look into the matter of occupation in these cases rather than with any possible thought of the association of lead in the etiology of her symptoms.

To my surprise she told me that she had recently been painting some rooms in the flat which she occupied, and as her time for such occupation each day was limited, she had taken the spare hours before her evening meal—the heaviest meal of the day, by the way—every day for a week in order to finish the work. She and a friend had taken an apartment on the “lower East Side” in New York, partly with the idea of doing settlement work, but partly also in order to study to the best advantage conditions among the poor, for both of them made their living by writing for newspapers and magazines. They had found it impossible to get the landlord to paint the flat for them, and when they looked around among the painters they found that they were so occupied at this season of the year—the early part of October—that it might be weeks before anyone would be able to do the work for them. Rather than live in the dirty quarters that had been the result of years of successive foreign

life before they moved in, they, or rather the patient, because she had a knack for doing most things, set about painting the room for themselves. The result was an attack of painters' colic, very unexpected in a woman writer for the magazines. It is well-known that very susceptible men, who take up the painting trade, usually have the unpleasant sequela, likely to result from their occupation, forced on them very early in their experience, so that this case is not surprising except for the extremely small amount of lead that had been necessary to produce the symptoms.

The fact that the painting had been done in order to take advantage of the daylight, shortly before the evening meal,—her principal meal of the day,—probably added to the facility with which poisonous symptoms ensued. It is generally recognized now that it is not the lead which may be breathed in, nor as used to be thought absorbed through the pores of the skin, that produces lead poisoning. Like the causes of infectious diseases the lead is ingested by the mouth. It is not pleasant to think that the *materies morbi* of typhoid fever finds its way into our system by the mouth, for it is always of fecal origin, yet this we know now to be actually the case. Stranger still it may appear, but it is nevertheless true, that it is the lead that is eaten on food, that causes lead poisoning. It is almost impossible to remove lead from the fingers after one has been painting, unless special precautions are taken to secure its removal. White lead is used on external surfaces mainly because it sheds water well. Stains of it that get on the fingers refuse to be dissolved in water then, and must be rubbed off either by pumice stone, or sand-soap, or some other mechanical means, such as long rubbing with a brush. It has been shown that even ten days after a workman has stopped using lead, traces of its presence on his fingers, especially around the nails, may be readily demonstrated by means of certain reagents which produce a black or dark brown color wherever lead is present.

It is probable then that a woman unaccustomed to painting would get much more lead on her fingers than the ordinary workman, and, not realizing the danger, would leave much more of it there after a perfunctory washing that would make the hands apparently clean. This would find its way onto bread and other materials eaten directly from the fingers, and, as in the early days

of housekeeping under such circumstances, meals would be apt to be taken rather carelessly and without the employment of many utensils, it seems not unlikely that food generally would be handled much more than is usually the custom. Here seems to be the explanation of this curious case of acute poisoning of a type that is probably more frequent than might be thought from the rare reports of it in the literature.

It is usually said that lead has a selective action for the musculospiral nerve. In the same way it is declared that alcohol has a selective action on the anterior tibial nerve. This selective action for which no reason can be given has always seemed to me mythical. The musculospiral nerve is the nerve which in painters carries the most impulses during the working hours. A painter is constantly using his wrist and forearm in the movements of his brush. This is true to a greater degree than for any other occupation. This is the nerve therefore that is predisposed to any affection by reason of the fact that it is used up to its capacity or even a little beyond. Lead is probably present in all the nerves of the body in the same degree as in the musculospiral, even when the lead paralysis occurs, but the overuse of the musculospiral leads to this nerve being more seriously affected.

This same line of reasoning would seem to apply to the anterior tibial nerve in cases of alcoholic neuritis. During the process of standing and in walking and moving about, the anterior tibial nerve has to carry all the impulses which enable a man to stand erect on his feet, to carry the burden of his own weight, and to give the spring at the ankle which enables him to walk rapidly or slowly as the case may be. It is in constant use whenever the man is on his feet. It is then the most used nerve in the body in men of all occupations, even those who follow a sedentary habit of life, for they get their exercise mainly by walking. It will be the first nerve to betray the presence of the irritant poison when the nerves throughout the body are affected by some poisonous substance.

A very interesting consequence of the affection of these nerves is that during the preliminary stage, before actual symptoms of either lead or alcoholic neuritis become manifest, these portions of the body are likely to be overfatigued and to give considerable discomfort on rainy days. The reason for this is not hard to find,

once the neuritic condition has actually developed. Before this there may be no suspicion of the process that is actually going on and yet has produced no definite indication of symptoms. In cases, therefore, where patients who are occupied with lead or who indulge in alcohol complain of wrist and ankle discomfort and painful fatigue on rainy days, the diagnosis should not be rheumatism, which means nothing, but a suspicion should be aroused of the beginning of the specific toxic neuritis into which they are slipping.

The fourth case was that of a painter who came on a slippery winter day for treatment of a sprain of the wrist resulting from a fall on the street. The wrist was painful and rather swollen, and some of the ligaments within the joint seemed to have been torn. After the application of some iodine a moderately tight bandage was put around the wrist to prevent the hyperæmia that would occur as a consequence of the injury, from doing any harm by attracting the blood to the surface, and he was asked to come again in a few days. The next day he turned up with a distinct wrist-drop. Only then did the question of his occupation seem important, and it seemed to furnish sufficient explanation for the unusual symptom or complication of sprained wrist. It is evident that in these cases, which are not at all unusual, the chronic lead poisoning has been for some time producing the plumbic neuritis in the musculospiral nerve which eventually leads to wrist-drop. This, however, gives no manifestation until it has proceeded to a marked degree, unless some intercurrent injury leads to an outbreak of the symptoms before the full development of the disease.

Those who are familiar with cases of alcoholic neuritis will recall similar incidents. A man suffers from a sprained ankle and then after a few days symptoms of alcoholic neuritis develop to complicate the case. It is evident that the alcoholic neuritis has developed not as a consequence of the accident but that that was, as it were, the last straw. Alcohol had been affecting his anterior tibial nerve for some time. This probably manifested itself in tired feelings and perhaps even in some pain on rainy days. After the accident, however, the true cause for these symptoms became evident. The question is often asked, Why has alcohol a specific selective action for the anterior tibial nerve, and why does lead

affect by preference the musculospiral nerve? There is often declared to be some wonderful mystery of specific action in these effects. I have never been able to persuade myself, however, of any such thing, but on the contrary I have thought that the action of alcohol and lead in these cases was not specific, but was only the result of a set of circumstances which need only be rehearsed to give the explanation of the supposed mystery.

With the painter the most used nerve in the body is the musculospiral nerve, for while handling his brush he is constantly moving his wrist. Anyone not used to painting, who tries to do a little of it, especially above his head and in and around corners, will find at the end of an hour that his forearm is extremely tired. After a time the painter gets used to this and is able to go on with his work all day. He has to send down so many impulses along his musculospiral nerve, however, that this is in a constant state of lowered resistive vitality and so it is not surprising, when there is lead in the system, that this nerve should be the first to show marked effects. This does not mean that other nerves are not affected, for lead affects every nervous structure in the body, but that only this nerve is most affected. Alcoholic neuritis shows itself in the anterior tibial nerve because, for most people, standing and walking are the main forms of exercise, and this nerve is very much used. The muscles which it supplies are weaker than their opponents and are the first ones in the legs to show tire. When there is alcohol in the system, then, the anterior tibial nerve, as is the case with the musculospiral in cases of plumbism, is the most exhausted nerve, the one with lowest resistive vitality, and for this reason it is affected.

I have thought that these cases of latent, or what might be called insidious lead poisoning, would be of interest because the effects of lead are much more important, more extensive, and more lasting than we used to think. Lead poisoning is no mere incident, easy to be gotten over, but usually means a serious disturbance, often permanent, of the most important tissues of the body. We have learned in recent years that very few of the genuine pathological conditions are mere incidents. Gonorrhœa used to be considered a passing event, but now we know that this is not the case in probably the great majority of instances. Even that most trivial

of ailments in the estimation of old-timers, a cold in the head, now has acquired a new significance since we know about its possibilities of affecting the sinuses and producing serious changes in important sense organs and especially in the structure related to the ear. The one important thing to be remembered about lead, however, is that the avenue of entrance for the poison is always through the digestive tract. It is not respired to any great extent and it is not absorbed through the pores of the skin, though this used to be very commonly thought and taught. Like typhoid fever germs, lead must be swallowed, and yet, like that disease, it will probably continue to work serious ravages, just because people are negligent of what they eat and drink and because the precautions necessary to prevent the ingestion of the toxic material seem too troublesome to take.

RECURRENT TEMPORARY AMBLYOPIA OF ANGIO- SPASTIC ORIGIN AND THE ASSOCIATION OF RETINAL ANGIOSPASM WITH OTHER VASO- MOTOR NEUROSES

BY F. PARKES WEBER, M.A., M.D., F.R.C.P.

Physician to the German Hospital, London

AND

R. GRUBER, M.D., M.R.C.S.

Ophthalmic Surgeon to the German Hospital, London

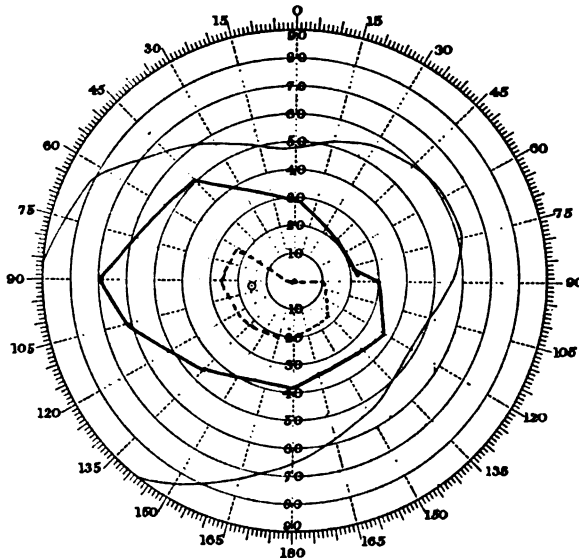
MRS. E. F. C., 39 years of age, an active and well-nourished woman, in the middle of November, 1903, suddenly became almost completely blind in the left eye. It seemed, according to her explanation, as if a curtain had suddenly dropped in front of the eye. At first she could only distinguish light from darkness with that eye, but soon afterward she could see the lower part of an object she looked at, but not the upper part. In about 3 weeks from the onset of the attack she thought she had practically recovered natural vision in the affected eye, though the objects she looked at still appeared to her a little misty. Since then the patient has been subject to severe recurrent attacks of headaches about once every fortnight on the average, but of late perhaps a little less frequently. These headaches, which are chiefly migraine-like on the left side of the head, often begin with a painful sensation behind the ear, followed by frontal pain, lasting for hours and even sometimes for a whole day. Often the pain commences in one or both temporal regions. During a part of some attacks she sees a rainbow-colored figure before her left eye, mostly blue and red, radiant and brilliant "like the colors of a magic lantern or a kaleidoscope," according to her description. Sometimes, but not always, the rainbow-figure (rainbow-scotoma) when it goes, leaves a black spot behind it, which blots out the visual field. As her sight returns everything seems to her to be very far off. These attacks are not accompanied by

visual or auditory hallucinations, nor by vomiting. The right eye as a rule remains unaffected, but during some of the attacks it seems also to have been involved though in a minor degree and never while we have had the patient under observation.

The patient was married at 21 years of age and her only child (a boy, living and healthy) was born when she was 25 years of age; she had had no miscarriages. Examination of the heart, lungs and abdominal organs showed nothing abnormal. Menstruation was natural. There was no goitre, nor any tachycardia.

FIG. 1.

LEFT



The continuous line maps out the field of vision for white (1 cm²). The interrupted line maps out the field for red.

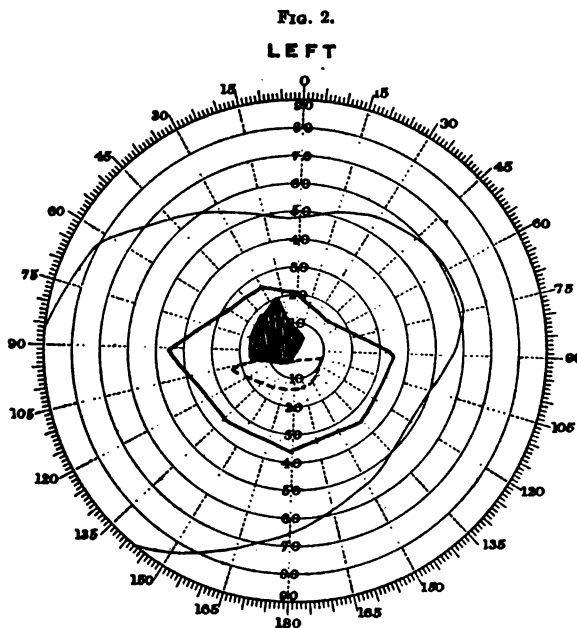
Examination of the Eyes.—Central vision $\frac{5}{6}$ in both eyes (not quite full in the left one). Central color perception perfectly normal in both eyes. Reaction of the pupils normal. Function of the oculomotor muscles normal. The ophthalmoscopic examination of the left fundus (as seen on November 23, 1903) reveals a slight but unmistakable contraction of the two branches of the inferior retinal artery, just outside the optic disc. These branches are only about half the size of the corresponding upper ones and so pale

that the blood column is partly lost. The thinning is marked all along their course, but chiefly near the edge of the disc. The lower half of the retina shows a slight milky pallor contrasting with the redness of the upper portion, but there is no sharp line of demarcation—only a very gradual transition—between the two portions. These ophthalmoscopic changes in the left eye correspond to a well-marked contraction in the visual field. Besides some concentric contraction the left visual field shows a peripheral defect of the upper inner quadrant, and a nearly complete defect for colors upward from the point of fixation (upper relative hemianopsia). (See Fig. 1.) The visual field of the right eye shows slight concentric contraction for colors, but is quite normal otherwise.

Sometimes she has had a feeling of swelling of the breasts and has been told by her mother that her breasts are really enlarged on these occasions. She has been for a long time subject to paræsthesiæ of the fingers (feelings of swelling and "pins and needles"), especially on waking up in the morning, when the fingers look pale ("local syncope"). Once or twice she has suffered from a feeling of swelling and numbness in the tongue. She has been subject to occasional feelings of faintness or giddiness since childhood and since childhood she sometimes has had temporary difficulty of speech, for instance, she may be suddenly quite unable to recollect the name of an ordinary object. Occasionally there has been uncontrollable inclination to cry. She thinks her headaches were often induced or aggravated by excitement, worry or drinking tea. A glass of beer likewise seems to have had an injurious effect. We have not found any anæsthesia. Pharyngeal reflex, conjunctival reflex and plantar reflex not readily obtained. When elicited at all in either foot the plantar reflex is very slight, but of the normal (flexor) type. Knee-jerks very brisk. No evidence whatever of past malaria, syphilis, lead poisoning, or indulgence in alcohol. We have not ascertained anything in the family history which appears to bear on the patient's complaint, unless it is that her father, who died of pulmonary tuberculosis at fifty-three years of age, was said to have been of a very excitable nature.

Bromides, iodides, zinc valerianate, antipyrin, phenacetin, etc., were employed in the treatment, and keeping the bowels open by the help of a sulphated mineral water seemed to do good. Under this

treatment the patient's general and subjective condition showed a very marked improvement which continued to the last days of September, 1906. Then she had a very bad attack which lasted for quite ten days. During part of this time she had a feeling as if she were flying, difficulty in articulation, and a rainbow-scotoma which left behind it an absolute and positive scotoma¹ in the affected (left) eye. (See Fig. 2.) She is quite sure that she never had this before. Since then the condition of her eye has been practically stationary; the scotoma in particular has persisted unchanged. Her



The continuous line maps out the field of vision for white (1 cm²). The interrupted line maps out the field for red. The shaded area denotes the absolute scotoma.

vision, though fixation is now markedly eccentric, is still $\frac{1}{2}$ in the left eye. The ophthalmoscopic appearances remain as before. In the right eye there is no scotoma.

¹ A positive scotoma is one of which the patient is himself conscious, whilst a negative scotoma is only found by special examination (e.g., by the help of the perimeter). An absolute scotoma signifies the complete loss of all perception of objects within the affected area, whilst in a relative scotoma the loss is only partial, e.g., for colors.

An occasional peculiarity of the visual fields in our patient must be mentioned here. On several occasions the perimeter examination revealed in unmistakable fashion the phenomenon known as Wilbrand and Foerster's "Verschiebungstypus." This we would term "progressive fatigue-contraction" of the visual field, or, as Reuss calls it, "spiral" or "screw-like" contraction. Wilbrand and Foerster's test is applied in the following manner. We start the perimeter-object from the temporal side and cross steadily over to the nasal side. The point where it first appears to the patient and that where it disappears are noted. Then we gradually recross to the temporal side and note where the perimeter-object disappears. If the result of the test is positive the point last noted will be nearer to the centre than the one first noted. Then we proceed similarly with the nasal limit of the field of vision and so on. We thus obtain a screw-like or spiral reduction of the visual field, the field becoming smaller the longer the examination lasts.²

We shall now shortly refer to cases published by various observers in the literature of the subject.

In the case of a man, aged 59 years, with Raynaud's disease, observed by Raynaud himself (*Archives Générales de Médecine*, 1874, 1, 8) there was partial loss of vision, not during, but following the attacks of local asphyxia of the extremities. The retinal artery and its branches were observed with the ophthalmoscope to be constricted and to be narrower close to the optic disc than at the periphery. During the attacks of lividity in the extremities, when vision was at its best, the branches of the retinal artery showed partial constrictions and occasionally the observer could see one of these local narrowings develop, last a certain time, and then disappear from one vessel to reappear on another.

L. E. Stevenson (*Lancet*, London, 1890, November 1, 917) described the case of a woman, aged 25 years, with Raynaud's disease leading to gangrene of the toes. When in the Cumberland Infirmary she experienced recurrent attacks of temporary complete loss or dimness of vision, which Stevenson supposed to be due to spasm of retinal arteries. He could, however, unfortunately not examine the patient with the ophthalmoscope during an attack.

² Compare K. M. Langer, *Beiträge zur Augenheilkunde*, Hamburg, 1907, 68, 10.

There was a history of eating rye-bread for a long period, but Stevenson did not think the case was one of ergotism.

In spite of these two reports there is no doubt that angiospastic phenomena in the retina have seldom been observed in association with Raynaud's symptom-complex of the extremities. The causal connection of the two conditions has indeed been doubted by H. Wilbrand and A. Saenger (*Die Neurologie des Auges*, Wiesbaden, 1906, 3, part 2, 998), and this question seems to be of so much practical and theoretical importance that any cases bearing on the subject should be recorded.

Hans Curschmann ("Ueber vasomotorische Krampzustände bei echter Angina pectoris," *Deutsche med. Wochenschrift*, 1906, September 20, 1527) narrates the case of a woman aged 43 years (Case 3) who suffered from attacks of angina pectoris, with temporary right-sided amaurosis, probably due to retinal angiospasm. Curschmann's observation is extremely interesting in the present connection, since attacks of angina pectoris (true angina as well as pseudo angina pectoris) may likewise be associated with angiospastic conditions of the extremities and skin, as Nothnagel pointed out in his description of what he called "Angina pectoris vasomotoria" (*Deut. Archiv für klin. Med.*, 1867, iii, 309).³

H. N. Noyes (*Text-book of Diseases of the Eye*, New York, 1890, p. 547,) recorded two cases of temporary amblyopia apparently due to spasm of retinal blood-vessels. In one case the patient, a man, remained totally blind in both eyes for 16 hours. Twenty-four hours from the commencement of the attack, when Noyes saw him, he could count numbers only six feet away. The arteries were seen to be contracted, the veins about normal. With inhalation of amyl nitrite ⁴ vision became normal in 20 minutes. In the other case a woman aged 43 years complained of losing her sight for 15 to 30 minutes every 24 hours. At first the right eye only had been

³ See also Hans Curschmann, *loc. cit.*; also E. Schmoll, "Ueber motorische, sensorische und vasomotorische Symptome verursacht durch Koronarsklerose, etc.," *Münchener med. Wochenschrift*, 1907, No. 41, 2027.

⁴ This is interesting in regard to statements that amyl nitrite does not produce its characteristic vasodilator effect in the case of the retinal arteries. Compare also Hilbert (*Centralblatt für prakt. Augenheilkunde*, 1891) who saw pulsation of the central artery of the retina in ophthalmic migraine disappear under inhalation of amyl nitrite.

affected but during the more recent attacks she had been blind in both eyes. Ophthalmoscopic examination of the left eye during an attack affecting that eye showed the arteries reduced in size and the veins normal. The attack passed off in a few minutes and the arteries grew larger.

A. H. Benson, of Dublin, read a paper at the Eighth International Ophthalmological Congress at Edinburgh in 1894 on "Recurrent Temporary Visual Obstructions" (from Retinal Vascular Spasm), published in the Transactions of the Congress in question (page 81). In his patient (a man aged 32 years) Benson found by ophthalmoscopic examination of the affected (left) eye during one of the attacks of amblyopia that the largest division of the inferior temporal artery of the retina was entirely bloodless in part of its length. During the examination the anæmic portion of the vessel seemed to move towards the periphery of the fundus and then to disappear suddenly, leaving the whole fundus in its usual condition. Benson thought that what he saw represented only the final stage of the attack.

A. Wagenmann (*Archiv für Ophthalmologie*, 1897, 44, 219) gives the case of a man aged 69 years who had lately suffered from attacks of temporary loss of sight in the right eye, lasting from a few minutes to a few hours. On recovering vision after the severer attacks everything seemed to the patient to have a blue color. During one attack the retinal arteries were found quite empty, and the veins smaller than their natural size. Blood began to reappear in the arteries as a thin red line after ten minutes, and within half an hour normal sight and the ordinary ophthalmoscopic appearances were regained.

J. W. Barrett (*Ophthalmic Review*, 1902, 21, 281) relates the case of a man, aged 60 years, who on waking from an afternoon sleep found that he was quite blind in the right eye. After about 2 hours the upper part of the field of vision gradually commenced to return, and in another hour he was able to see as usual. When the patient came under observation on the day following the sudden loss of sight the visual field was normal in each eye. The right optic disc was perhaps a trifle paler than the left on the outer side and the superior nasal vein was constricted near the disc. There was no evidence of any alterations in the retina itself. The pupils

were equal and reacted normally to light and accommodation. The pulse rate was 46 per minute. The attack of temporary amblyopia had been preceded for one week by pains in the head. There was no history of syphilis. Dr. Maudsley who examined that patient said that he found no evidence of cardiac, arterial or renal disease.

W. T. Shoemaker (*American Journal of Med. Sci.*, 1904, 677) wrote that in a young man aged 17 years (who was returning from a play in which the heroine suddenly lost her sight) the field of vision in the left eye became suddenly black with the exception of the lower portion. By ophthalmoscopic examination there was an ischæmic retinal area corresponding to the blind portion of the visual field.

Sulzer (Soc. d'ophtalmologie de Paris, March 5, 1907) described the case of a man aged 63 years who after excessive brain work suddenly became blind in the right eye except for a minute area in the centre of the visual field. This gave the patient the impression of looking through a hole made in a window of rough glass.⁵ The upper part of the field of vision was soon regained and 15 minutes later sight was again normal. During the following weeks the patient had several temporary attacks of scintillating scotoma in the left eye. His blood-pressure was excessive. This case of temporary amblyopia hardly comes into our category, especially as the ophthalmoscopic appearances during the attack in the right eye were not ascertained. De Lapersonne suggested a condition of peripheral ischæmia of the retina to account for the phenomena in the right eye as described by the patient in question.

Many cases of temporary amaurosis of uncertain origin are referred to by H. Wilbrand and A. Saenger in their great work, *Die Neurologie des Augens* (Wiesbaden, 1906, 3, part 2).

C. E. Beevor and R. M. Gunn (*Trans. Ophthalm. Soc. of the United Kingdom*, 1899, 19, 75) gave the case of a man aged 34 years in whom obliteration of a branch of the retinal artery of the right eye followed frequent attacks of temporary amblyopia (chiefly

⁵In the discussion on Sulzer's case Antonelli said that cases of bilateral temporary amblyopia with relative "peripheral scotoma" and conservation of central vision were not rare. He had published one case of monocular "peripheral complete scotoma"; the patient in question explained that he saw with the affected eye "as if he were looking through a tube."

in the right eye) and led to persistent loss of the upper half of the field of vision in the affected eye. Ophthalmoscopic examination of the right eye showed pallor of the lower half of the optic disc and shrinking of the lower branches of the retinal artery. The patient had a sister who was subject to recurrent attacks of sick headache and likewise to occasional temporary attacks of blindness in the right eye. Other cases bearing on their observation were referred to by Beevor and Gunn and by those who took part in the discussion following their paper.

G. W. Thompson (Trans. Ophthalm. Soc. of the United Kingdom, 1902, 22, 177) showed a woman aged 34 years who for the last 10 years had suffered from attacks of sick headache with temporary loss of vision in the right eye. In September, 1901, she had an attack from which the vision had never properly recovered. The lower part of the field of vision in the affected (right) eye seemed to be covered by a black mist, and by ophthalmoscopic examination the upper half of the optic disc appeared pale and atrophic; the veins and arteries going to the upper part of the retina were slightly streaked with white lines for a short distance from the optic disc and appeared to be constricted at their point of exit from the disc.

R. A. Lundie (*Ophthalmic Review*, London, 1906, 25, 129) made an ophthalmoscopic examination in a man aged 88 years suffering from an attack of temporary amblyopia in the left eye. He found a constriction in the artery supplying the blind (upper) portion of the retina. The constricted part of the vessel (the part just beyond the optic disc) seemed quite empty of blood, but could be traced as a whitish streak. After about one hour the patient recovered his sight. Lundie points out that in many cases of supposed retinal embolism there have been prodromal attacks of temporary blindness, possibly due to angiospasm, the final attack differing from the others in its permanency. In regard to pathological evidence of the occurrence of retinal embolism Lundie quotes O. Haab's summary that "in not a single instance, not even in which it was very likely to be an embolus, has the proof of embolic nature been at all convincing." In this connection we may mention that Max Reimer, in his paper on the "so-called embolism of the central artery of the retina and of its branches" (Archives

of Ophthalmology, November, 1903), pointed out that in cases of true embolism or thrombosis, besides the occurrence of blindness, one would expect to find by ophthalmoscopic examination a breaking up into granules of the blood columns of the affected retinal vessels.

Remarks.—It seems to be quite clear that these cases of retinal angiospasm, whether ultimately followed or not by permanent changes in vision and in ophthalmoscopic appearances, are allied to the various vasomotor neuroses in other parts of the body, the best-known type of which is spoken of as “Raynaud’s disease” or “Raynaud’s symptom-complex.” In our own case there was abundant evidence of the frequent occurrence of vasomotor disorder in other parts of the body and we have quoted cases in which attacks of amblyopia apparently due to retinal angiospasm were associated with Raynaud’s disease, described by Raynaud himself and by L. E. Stevenson, and another case, recorded by Hans Curschmann, in which similar attacks of temporary amblyopia probably likewise due to retinal angiospasm, were associated with (angiospastic) phenomena of angina pectoris. Some of the cases show that retinal angiospasm is not necessarily limited to one side, but may occur in both eyes simultaneously.

Patients with temporary spastic amblyopia are not rarely subject to attacks of migraine, and they may present hysterical phenomena also. In our case there was evidence both of migraine and hysteria. It is interesting that several observers have witnessed constriction of the central artery of the retina by ophthalmoscopic examination during attacks of migraine. In this regard Wagenmann (*loc. cit.*, 238) quotes Walton, Landsberg and Siegrist, and says that Siegrist in two cases found that the retinal angiospasm was confined to the side on which the pain of migraine was complained of. Cases similar to these two of Siegrist have been reported by Parisotti (*Annales d’Oculistique*, vol. 99, p. 321), Guagliino (*Annales d’Oculistique*, 65, 129), and Hilbert (*Centralblatt für prakt. Augenheilkunde*, 1891).⁶

There is, we believe, some evidence that in the various angiospastic neuroses, and retinal angiospasm in particular, the primary

⁶ We have already alluded to this case of Hilbert in a foot-note regarding the action of amyl nitrite on the retinal blood-vessels.

functional fault is in the cerebral cortex. In favor of this view we would adduce:

1. The fact that vasomotor neuroses are not uncommonly associated in the same patient with hysterical phenomena is probably due to a functional disturbance in the cerebral cortex. In hysteria the distribution of the anæsthesias, paralyses and spasms, the phenomena of hystero-epilepsy and the well-known connection of hysteria with emotional factors, make it probable that the functional change on which the manifestations of hysteria depend is in the brain, probably in the cerebral cortex. S. J. Sharkey (Brain, Spring, 1904, 4), in summing up the main reasons why the cerebral cortex is to be considered the part chiefly at fault in hysteria, suggests in particular that the reason why patients with hysterical hemianæsthesia are not usually conscious of their loss of sensation is that the cortical centres are the parts affected, whereas in hemianæsthesia due to gross brain disease the sensory fibres in the internal capsule are generally diseased and the cortical centres are sound, so that the patient perceives his anæsthesia.

2. The fact, already mentioned, that retinal angiospasm is frequently associated with migraine, a "paroxysmal neurosis" in which the cerebral cortex is undoubtedly involved. Indeed, the occasional occurrence of homonymous hemianopsia during or after attacks of migraine, can practically only be explained on the supposition that the cerebral cortex (occipital lobe) is involved in the attack.

When a central scotoma occurs in these cases it is almost certainly of peripheral origin. In our case the existence of a causal connection between the central scotoma and the vascular retinal changes can hardly be doubted. So far we entirely agree with Jolly (Berliner klin. Wochenschrift, 1902, No. 42) who for unilateral scotoma in ophthalmic migraine postulates a peripheral origin in either the optic nerve or the retina, an assumption which is also endorsed in the well-known text-book by Wilbrand and Saenger (*loc. cit.*).

But for the reasons which we have already given we believe that angiospastic conditions in the retina are, in common with many angiospastic conditions elsewhere, *only local manifestations of a central disturbance which has its main seat in the cerebral cortex.*

With the supposition that attacks of retinal angiospasm such as those which we are considering are due to a functional disturbance of part of the cerebral cortex it is quite in keeping that similar conditions of retinal angiospasm may be induced or favored by toxic or toxæmic factors, as in some cases of toxic amblyopia connected with quinine, lead salts, methyl-alcohol, uræmia, influenza, malaria, etc. In the same way emotional and mental symptoms and also various functional nervous disorders may be set up or at all events modified in one way or another, by toxic or toxæmic conditions and by various drugs; as examples we may instance the various abnormal mental states induced by alcohol, cannabis indica, septic pyrexial conditions, etc.

Neither is it at all surprising that organic changes in the vessels should sometimes follow retinal angiospasm. A person may have repeated attacks of temporary amblyopia due to retinal angiospasm, and in the intervals he may seem none the worse for them; but then an attack may occur accompanied by permanent partial or complete loss of sight in the affected eye and by permanent ophthalmoscopic changes. The probable explanation of such a disastrous result is either that the vaso-constriction led to thrombosis or that the spastic anæmia lasted long enough to give rise to permanent ischæmic degenerative changes. In the same way a patient may recover from many paroxysms of Raynaud's symptom-complex in the extremities, but finally an attack may last too long (or be accompanied by thrombosis) and thus be followed by local gangrene of fingers or toes. In our patient the ophthalmoscopic features were comparatively slightly marked. They were not due to the occurrence of thrombosis, but doubtless to prolonged ischæmia during the attack of November, 1903, leading to permanent alterations and thus causing the lasting loss of the upper part of the field of vision in the affected eye. The ophthalmoscopic changes in our case were so slight that they might easily have been overlooked. Such changes may indeed have been overlooked in similar cases in which ophthalmoscopic examination was reported to have shown nothing abnormal.

It must not be forgotten that thrombosis may be favored by organic changes in the vessel-walls associated with repeated angiospasm. Thus, thickening may occur in the walls of the arteries

in limbs affected with Raynaud's disease. There is likewise another connection of some kind between angiospasm and organic vascular disease. The precise nature of this connection is not quite clear, but it is doubtless due to some reflex action, and its existence is evidenced by the fact that very troublesome angiospastic and vasomotor phenomena often accompany or occur "on the basis of" organic vascular changes. For instance, in the heart and limbs, remarkable vasomotor phenomena are observed in some cases of true angina pectoris with sclerosis of coronary arteries, and the striking symptoms of "intermittent claudication" or "dyskinesia intermittens" of extremities are sometimes but not always found in limbs affected by the so-called "idiopathic arteritis obliterans."⁷

Treatment.—During the paroxysms vasodilators, such as amyl nitrite and trinitrine,⁸ may be tried; in the intervals treatment by iodides, bromides and valerian preparations is often useful. For underlying conditions of anæmia, neurasthenia, goutiness, cardiac weakness,⁹ etc., treatment on general principles is indicated. Tonics may be required at times. Errors in regard to diet and general hygiene must be remedied. The diet may be too nitrogenous and stimulating, or may be insufficiently nourishing, or there may be constipation or chronic disorders of the digestive system requiring attention. A change may be called for from a sedentary life in stuffy rooms to one in well-ventilated rooms with sufficient exercise in the open air. Sometimes the question of special climates and health resorts arises, especially in regard to the avoidance of cold and damp during the winter months. The removal of mental worry, overwork, and possible adverse emotional factors, may have to be considered. Excess of tea, coffee, alcohol and tobacco, has of course to be avoided. Naturally any errors in refraction that there may be have to be corrected by glasses.¹⁰

⁷ Cf. Parkes Weber, "Arteritis Obliterans of the Lower Extremity with intermittent Claudication (Angina Cruris)," *Lancet*, 1908, 1, 152.

⁸ See previous footnote regarding the action of these vaso-dilator drugs on the retinal blood-vessels.

⁹ In regard to possible connection with cardiac trouble see E. Nettleship, "Repeated Paroxysmal Failure of Sight in connection with Heart Disease," *British Medical Journal*, June 14, 1879, p. 889.

¹⁰ Cf. Martin, *Bulletin de la société française d'ophtalmologie*, Paris, 1884.

Surgery

CLINICAL LECTURE ON RECONSTRUCTIVE SURGERY OF THE FACE

BY JOHN B. ROBERTS, M.D.,

Professor of Surgery in the Philadelphia Polyclinic

I. Loss of the ala of the nose and extreme ectropion of the lower eyelid from burn.

II. Ectropion of the lower eyelid and staphyloma of the cornea from burn.

III. Partial rhinoplasty for deformity due to syphilitic ulceration and necrosis.

IV. Congenital absence of nose.

I. This patient fell against a heated radiator during unconsciousness from weakness at the beginning of an attack of typhoid fever. She lay some time with the left side of her face against the hot iron, and, as a result, suffered a burn of the eyelids, cheek, and ala of the nose. Sloughing of the tissues of the cheek and side of the nose occurred.

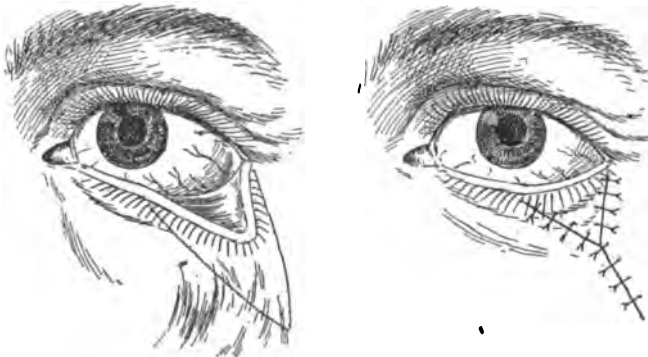
She applied to me for treatment for the deformity remaining after the parts had cicatrized. The conditions which I found were as follows: eversion of the upper eyelid by a puckered scar, extreme eversion of the lower lid towards the outer canthus, elevation of the upper lip at its left side and entire loss of the left ala of the nose, leaving a large opening into the nasal chamber. The eversion of the lower lid and the elevation of the upper lip were due to the contraction of a band of cicatricial tissue extending deeply into the cheek.

The solution of the problems depended for the most part on substituting for this deep scar tissue new material, in order to allow the upper lip to be drawn down into proper position and to permit the lower eyelid to be thrust upward, so as to close the eye and make it lie closely against the eyeball. In addition, special procedures have

been needed to fill the opening into the cavity of the nose. A series of operations have been done to accomplish this main object.

A V-shaped incision, under the eyelid with the apex upon the cheek, permitted the lower lid to be displaced upwards. At the same time the upper lip was pushed downward after an incision had been made, extending obliquely from the septum of the nose almost to the corner of the mouth. Incising the scar tissue of the cheek, between these two incisions, left a large gap upon the face which had to be filled with normal skin and subcutaneous fascia, in order to prevent the recurrence of strong cicatricial contraction.

FIG¹ 1.



V-flap for oblique ectropion.

Accordingly I cut a long flap with its base near the prominence of the malar bone and its rounded end far down on the side of the face underneath the lower margin of the jaw. This tongue of normal skin and fascia was dissected from the underlying muscles, great care being taken to avoid injury to the duct of the parotid gland. The flap was then turned upward and inward to fill the gap between the eyelid and the lip. This transference left a wound three quarters of an inch wide and about four inches long, running down upon the side of the face and under the jaw, in normal tissue, which was closed with sutures.

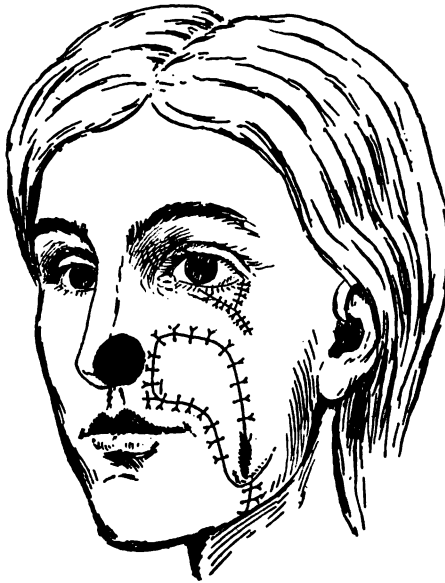
The tissue interposed upon the front of the face between the eye, the mouth and the nose was much more bulky than was needed to fill that space. It was made so, to be used at a later period for filling in the large opening at the side of the nose. This method of

transferring tissue from distant places, by what might be called successive planting or jumps, is a very valuable plastic procedure.

The result of this first attempt at correcting the excessive disfigurement of the girl's face was quite satisfactory, because it greatly lessened the deformity at the mouth and also that at the eye, though it did not perfectly replace the lip or eyelid.

While I waited for the mass of tissue planted in the front of the face to become sufficiently attached to the underlying tissues to permit further transference to the nose, I improved, by a series of

FIG. 2.



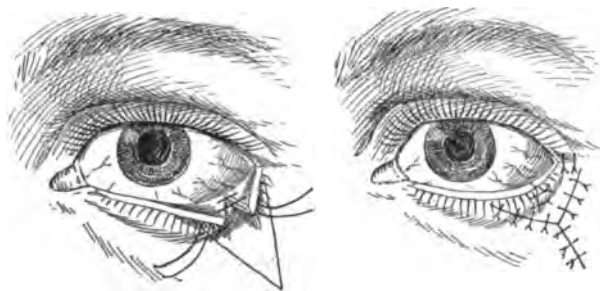
Tongue-shaped flap from side of face and mandibular region.

operations, the condition of the lower eyelid. This had been raised a good deal by the first operation, but did not hug the eyeball sufficiently and was still somewhat everted.

A second V-shaped flap was dissected up just below the eyelashes with its long axis running downward and outward, a wedge-shaped piece of the ciliary border and tarsal cartilage was removed and the outer corner of the lower lid stitched to the outer end of the upper lid, after freshening about a quarter of an inch of both lids

at the outer canthus. This little operation lessened the horizontal length of the lower lid, and at the same time pushed it up and drew it inward against the eyeball and prevented the recurrence of the outward displacement.

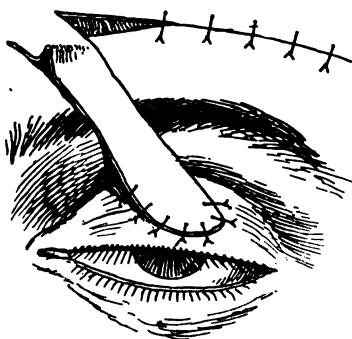
FIG. 8.



V-shaped flap, excision of wedge of tarsus and canthoplasty.

The upper lid was slightly everted at its middle by a burn, which had occurred between the edge of the eyelid and the eyebrow. An incision, parallel to the margin of the eyelid and about a quarter of an inch above it followed by dissection of the skin, permitted me to push the upper lid downward so that the eye could close.

FIG. 4.



Bridge flap from forehead to upper eyelid.

The raw space left on the surface of the upper lid had to be filled with new skin to prevent recurrence of the scar contraction.

A small flap was therefore cut from the forehead just above the eyebrow, with its base at the root of the nose and its rounded

end towards the outer or temporal region of the head. The flap was then displaced by carrying it over the eyebrow and stitching its rounded end to the edges of the raw surface left upon the upper eyelid. This flap, therefore, occupied a position somewhat like a bridge, its middle lying upon the uninjured eyebrow. The raw space left above the eyebrow, by the downward displacement of this flap, was closed by sutures after undercutting its edges. The two eyelids were then stitched together and were allowed to remain so for a few days. Later this bridge was cut across just below the eyebrow and the pedicle returned to the brow to cover a small raw surface left there.

FIG. 5.



Jumped flap used to fill opening in side of nose.

I shall to-day endeavor to make an ala and close the hole into the nose, left by the destruction of the ala by the necrotic burn. The mass of new tissue, transferred from the cheek near the angle of the jaw to the front of the face, has now been in position for several weeks, which is long enough for it to have gained good circulation from its new attachment. Its pedicle was cut about three weeks after its adjustment. I shall, therefore, cut from it a flap large enough and thick enough to fill the opening in the nose, turn it

towards the middle line and suture it to the margins of the abnormal nasal opening. Fine silk sutures have been used in all these operations. You see the new tissue, which is about the size of the end of one's finger, secured to the nose in such a way that circulation should, within a short time, be sufficient to permit a cut to be made through its base without danger of anæmic gangrene.

Dressings of dry sterile gauze will be applied to the nose for a day or two. After that time the gauze will be removed and not reapplied, for the cuts will be covered with dry crusts of sterile blood. The wounds will be kept clean if necessary by occasional washings with an antiseptic solution of bichloride of mercury and dusted with powdered boric acid or acetanilid.

I shall wait three or four weeks to make sure that this nasal plug has united thoroughly with the rest of the nose, so as to have sufficient circulation to maintain its vitality before dividing its pedicle. Less time would be sufficient if the attachment to the nose was more extensive. I shall then cut it loose from its attachment to the cheek by dividing the pedicle. The flap used to repair the upper eyelid was cut loose from its pedicle in a similar manner.

The small stumps of tissue left after the flaps have been detached will probably make unsightly prominences. Subsequent unimportant plastic operations will be required for restoring the surface contour of the brow and cheek. I shall not be in a hurry to get rid of these little pieces of tissue. I may need them to transfer to other portions of the face, either as skin grafts or as parts of flaps. If they are not needed for this purpose, they may readily be removed finally by elliptical incisions.

I recently inserted into the upper eyelid a small piece of skin removed from the front of her leg. This graft was a Krause flap, or graft, and consisted of the entire thickness of the skin. It was needed to allow the ectropion of the upper lid to be completely overcome. An incision in the eyelid was made, the edge of the lid drawn downward and the gap filled by a graft cut to fit it accurately. I stitched the graft in place with fine silk and covered it with aseptic rubber tissue. Such grafts are very valuable, when flaps with pedicles are not obtainable. Absolute asepsis is necessary for success.

The woman's countenance has been vastly improved by the operations already done. The tissue fastened to the nose will need

a number of minor operations to model it into a shape which will make it compare favorably with the normal wing of the nose on the other side. The scars made by the various operations will require time and frictions with oily preparations, such as *adeps lanæ*, to render them inconspicuous. Time and such manipulation will cause the surface of the face operated upon to assume a more normal color and outline. This change is due to the attainment of a normal vascularity and the gradual absorption of the inflammatory products.

Any minor irregularities of the surface may be corrected, at the end of about a year, by shaving off elevations and by raising depressions by means of incisions and sutures.

II. This woman's face was burned by the explosion of an oil lamp. She lost, as a result of the sloughing caused by the burn, the margins of both external ears and a small portion of the ala of one nostril. The entire face is discolored irregularly by white and pink patches due to a rather superficial burn of the entire countenance. To-day I shall do nothing to the ears or nose, but shall content myself with operating upon the two eyes, which have been damaged by the accident.

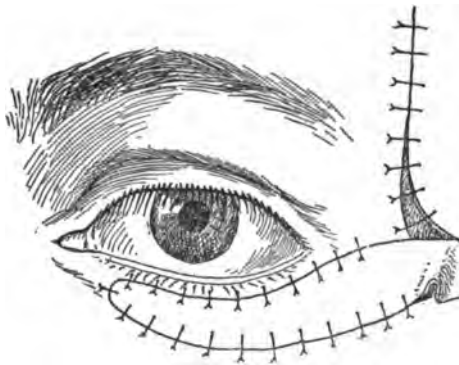
The left eye suffered a burn of the cornea without lesion of the lids. As a result, the cornea was destroyed and is replaced by cicatricial tissue to which the iris and possibly the lens have become adherent. The cicatricial structures have bulged forward giving rise to the condition called *staphyloma*. By *staphyloma* is meant a bulging of the weak scar tissue, so that the ball of the eye has become a white protruding mass thrust forward between the eyelids; thus causing an unsightly appearance.

Vision is destroyed and the patient wishes to have this eye made more comely. I shall therefore cut off the anterior portion of the eyeball and, after the wound has healed, apply an artificial eye to the stump. In order to retain as much as possible the mobility of the eye, I shall insert a glass sphere within the sclerotic coat to give the ball a globular shape. This spherical stump will permit the muscles of the eyeballs to move the glass shell, placed in front of it, almost as well as a normal eye. In adjusting artificial eyes it is important not only to have them match the

good eye, but to retain, as far as possible, the mobility of a normal organ.

The eyelids are held apart by means of a speculum, and under aseptic precautions the conjunctiva is divided in a circular manner around the cicatricial cornea and the front of the globe cut away with scissors, leaving the posterior portion of the sclerotic with the attached muscles. The contents of the globe, consisting of iris, lens, retina, choroid coat, and humors, are extracted from within the sclerotic by means of forceps. By means of sponges of gauze and hot water I carefully remove every particle of these structures

FIG. 6.



Temporal flap to correct ectropion.

and control the bleeding within the sclerotic coat. A small glass ball, sterilized by boiling, is dropped into the space formerly occupied by the vitreous humor.

With chromicized catgut sutures I close the sclerotic in a vertical direction over the glass ball. The conjunctiva is then brought over this vertical suture line and united with silk sutures making a horizontal seam. The most careful asepsis must be maintained during these procedures because the foreign body, which it is desired to encyst, would be rejected if suppurative inflammation occurred. This eye is now closed and covered with an aseptic dressing.

I now take up the operative treatment of the other eye. Here the globe is uninjured, but the lower lid has been dragged down by the contraction resulting from the burn of the cheek. The lid

instead of hugging the globe of the eye is everted, and as a result, the mucous membrane on its inner surface has become thickened and unduly red. Such a condition makes a very ugly disfigurement of the face.

There are various ways of treating ectropion of the lower lid. The choice depends upon the degree of eversion and the character of the tissues beneath the lid. If the skin of the cheek below the eye has been deeply destroyed by the burn, it is necessary not only to replace the everted lid, but to insert a flap of skin and subcutaneous tissue in the gap left by sliding the loosened lid upwards.

In this case, however, I find that the damage done to the tissues of the cheek has been comparatively superficial. I therefore displace the turned out lid upwards by a V-shaped incision running down

FIG. 7.



Strap flap from temple to lift up lower lid. The skin within the dotted line is cut away to make a raw surface and the strap-like flap is then sutured over the raw space.

on the cheek. The legs of this cut start at the inner and at the outer canthus of the eye close to the border of the lower lid. By pushing up the V-shaped flap of skin so made, I am able to press the inner surface of the lid against the ball of the eye. The point of the V-shaped flap has thus been raised on the cheek for a distance of nearly one half inch. The skin below is brought together by a line of sutures making a vertical seam. The edges of the displaced tissue are secured by fine silk sutures to the margins of the cheek wound, at a higher point than they occupied before the operation.

I now have the lower lid, which was formerly turned out, pushed up high enough to occupy its normal site; but it does not hug the globe of the eye quite closely enough. This I accomplish by cutting with curved scissors an elliptical piece out of the thickened mucous

FIG. 8.



Deformity of nose from specific necrosis in infancy. Full face.

FIG. 9.



Deformity of nose from specific necrosis in infancy. Profile.

membrane and the cartilage of the lid. The long diameter of the removed portion is horizontal. A stitch may be put in this region to hold the edges of the mucous and submucous tissue, so divided, close together. It is not always needed. You see now that the lower lid has been forced into its normal relation with the eyeball. This is the form of operation done on the lower eyelid of Case I.

If the scar tissue of the cheek in this case had been very thick, I should probably have made a curved incision under the eye rather close to the lashes, pushed the lid up and taken a tongue-shaped flap from the temple, and turned it downward and inward, to fill the gap. Experience has shown that the V-shape gliding operation, done on this patient, will not be successful when the scar causing the ectropion is deep. In some cases it is well to combine with the V-shaped incision, and to use in some cases without it, a strap-like flap running upwards on the temple. The surgeon thus lifts the outer side of the lower lid upwards by attaching the point of this flap to a higher portion of the temple, where a part of the skin has been previously removed to give it attachment.

The everted lid sometimes has become so hypertrophied that it is well to remove a wedge-shaped portion of its whole thickness. The base of the wedge is at the margin, the apex close to the attachment of the lower lid to the bony margin of the orbit. In the present instance these manoeuvres were not necessary.

The right eye of this patient will be covered for a few hours with an aseptic gauze dressing until the bleeding stops, after that, it will be simply dusted with a little powdered acetanilid. The other eye will have the conjunctival sac washed out with boric acid solution, ten grains to the ounce, every three or four hours.

III. This woman, who is about twenty years of age, lost a part of one nasal bone, the turbinate bones and a large portion of the nasal septum in early childhood as the result of specific disease, probably inherited. She therefore has almost nothing to represent the nose except an undeveloped lobule, undeveloped alæ and a slight nasal bridge. Between the deficient bridge and the almost infantile lower portion of the nose the surface of the nasal region is almost on a level with the cheeks. Her family speak of her as having no nose, because there is no projection of importance where the nose ought to be.

In this case the organ has not the characteristic shape of the syphilitic sunken nose occurring in adult life, because the loss of the internal structures occurred when she was an infant. There is not the marked transverse groove seen in the sunken nose of this disfiguring disease, when acquired after the face has been fully developed.

There are several ways of repairing noses of this sort. Fortunately this girl has very voluminous cheeks. Enough tissue can

FIG. 10.



Outline of flaps used to construct new dorsum.

FIG. 11.

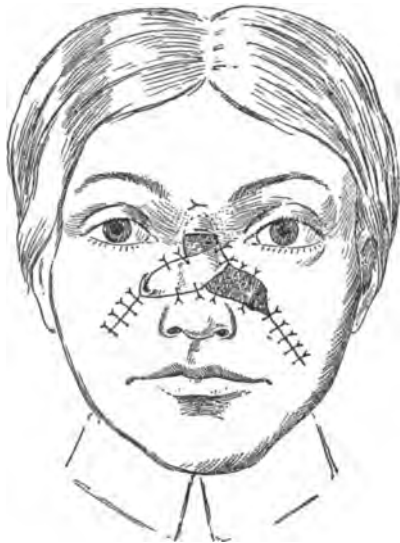


Diagram to show superimposed flaps when sutured.

be obtained from them to build up a fair semblance of a nose, without encroaching very much on the forehead.

In sunken noses of this degree the subcutaneous injection of melted or semi-liquid paraffin is not available. The deformity is too great. I shall, at first, make a transverse cut across the middle of the face, just above the diminutive lobule and alæ, directly into the cavity of the nose. The space left after pulling down and unfolding the tissues forming the end of the nose, I now fill by means of two flaps taken from the cheeks. These flaps have their

bases close to the side of what ought to be the nose and, as you see, run downward and outward parallel to the nasolabial furrow.

The left flap, which is about one and one-half inches long and a half inch wide, is turned upward with the skin surface towards the cavity of the nose. The right one is now twisted and its raw surface laid on top of the everted left flap. By stitching the flaps

FIG. 12.



FIG. 13.

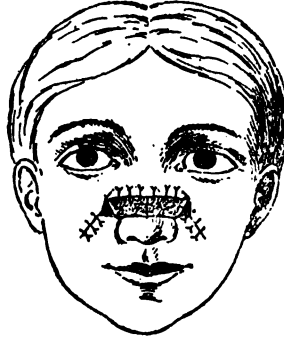
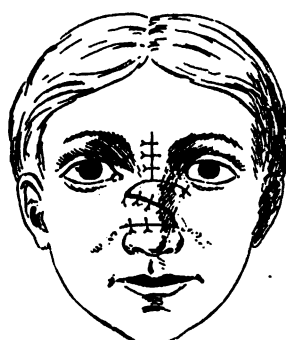


FIG. 14.



FIG. 15.



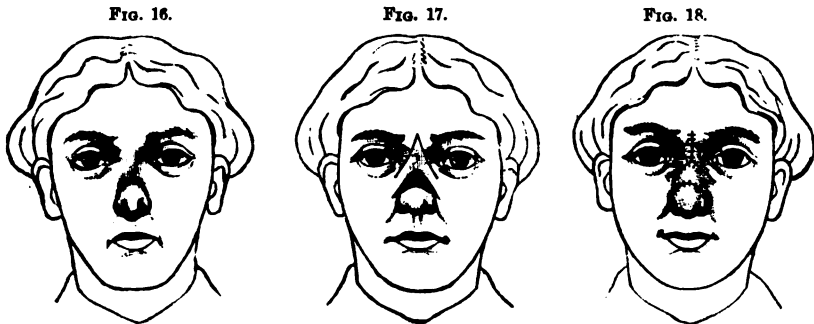
Roberts's method of making nasal bridge with cheek flaps and rhomboidal flaps from forehead.

in this position I have obtained a double layer of skin and subcutaneous fascia to fill the opening and give sufficient prominence to construct a fair substitute for the dorsum and sides of a nose.

As there is a distinct hollow under the skin at the point where the right nasal bone has been lost, I have cut the left cheek flap longer than the right. After making a tunnel under the skin where the bone is absent, I thrust the end of the left flap under it. This

elevates the skin and gives it the rotundity which the dorsum needs at that point. This point of the flap is held in position by a mattress suture, introduced by means of a thread with a needle on each end.

You will now see that the projection of the nose, from the front of the face, is not much less than that of a normal nose. It improves very much, even in this rough state, the patient's appearance. After the superimposed flaps have united, a good deal of minor operating will be required to shape the skin and fascia into a more seemly nasal organ. I have also sutured the wounds in the cheeks, which were left, by the raising of the two long tongue-like flaps. When healing has taken place, the scars will not be very marked.



Method of making nasal dorsum from skin of interocular space by simple sliding.

I have practiced with satisfaction another method for obtaining a similar result in rhinoplasty for this form of nasal deformity. Both flaps taken from the cheeks are turned up-side-down and united at the middle line over the opening left after cutting the lower portion of the nose free. Two rhomboidal flaps are then made from the structures over the nasal bones and lower part of the forehead. These are displaced downward, in the manner shown in the diagrams, on top of the granulating surface left in the middle line after the cheek flaps had united and contracted. This method, which I believe to be original, gives very little scarring to the forehead and cheeks, from which the new tissue has been taken. These diagrams will give you a better understanding than any description.



Fig. 19.



Fig. 20.



Fig. 21.

Photographs of deformity due to loss of lobe of the nose and the result after operation.

FIG. 22.



Photograph of congenital absence of nose. Case of Dr. Delno E. Kercher.

In simple cases a triangular incision made between the eyes will enable the surgeon to draw down the tissues from over the nasal bones and fill the opening made by his cross cut. This third method, however, is apt to make the middle of the dorsum of the nose too flaccid. This soft flabby nose may, however, be made to resemble a normal nose pretty well by having the patient wear spectacles, with pads pressing upon the nose like the pads of eyeglasses.

The lobe of the nose may be made from cheek flaps turned towards the middle line. Here are photographs of a woman, who lost the lobe from caustics applied to remove a so-called cancer. The result is seen in these two later photographs which were taken after I had operated.

IV. Congenital Absence of Nose. A very rare deformity is complete congenital absence of the nose as seen in this photograph of a girl baby several days old whom I recently examined. The photograph was taken by Dr. D. E. Kercher, who delivered the mother. There was double harelip and cleft palate with entire absence of the external nose. The space between the upper lip and the forehead and between the eyes was flat with the exception of a very slight elliptical swelling where the nasal dorsum should have been prominent. I was not sure whether this slight swelling and bony resistance was due to the nasal bones or to the nasal process of the frontal bone. If it was the latter, the nasal bones were congenitally absent. The child had no nostrils, no alæ, and no nasal bridge. The forehead was undeveloped as if the child had defective development of the frontal lobes of the brain. There was no prominence of the superciliary ridges, but the eyelids and eyes were bulging, as seen in the photograph. The eyes were dark. The child had a web between the second and third toes of both feet. The hands were normal; so were the ears. The head was small and the child's weight probably about $4\frac{1}{2}$ to 5 pounds. It had long dark hair. The anus and genitals were normal. It was born at term and lived about 5 days. There were no deformities known to be present on the maternal or paternal side of the family.

PERINEPHRITIC ABSCESS IN CHILDREN

BY CHARLES GREENE CUMSTON, M.D.

of Boston, Mass.

Surgeon to the Floating Hospital for Children, etc.

PERINEPHRITIC abscess may be defined as a suppurative inflammatory process arising in the fatty tissue surrounding the kidney. This affection, relatively frequent in adults, is extremely uncommon in children. Although many anatomists have stated that the fatty capsule of the kidney does not exist in children, I would point out that this is not the case. It is quite true that its development is far less than in the adult, but nevertheless it will always be found and from my personal observation I am inclined to believe that it attains a greater degree in little girls than in boys. Now the fact that the fatty tissue surrounding the kidney in children is small in amount makes it at once evident why perinephritic abscesses arise less often in early life.

There is one remark I wish to make, because I am unaware of its having been made before, although it is foreign to the subject of this paper, but it demonstrates the importance from the pathological view point that should be given to the development of the perirenal fatty capsule. In children, neoplasms of the kidney are frequent, comparatively speaking, and sarcoma is the type most prone to develop. Now, the most frequent etiological factor which is mentioned for the production of these growths is traumatism, and it is my opinion that the absence of the perirenal fat explains the frequency of renal growths in children. The kidney being deprived of this means of defence is more readily injured from traumatism, with the result that tumor formation arises in it, while in the adult a perinephritic abscess would be the outcome.

Two types of suppurating perinephritis exist, namely, those arising under the capsule and those arising outside the capsule. Since the latter type is by far the most frequent, it will be considered first. The pus may form multiple foci quite independent of each other, but usually the collection is single. It is more

particularly behind the kidney that the abscess forms, at that point where there is the largest quantity of perirenal fat.

The abscess may be complete or partial. In the first case, it involves the entire perirenal fatty capsule, while, in the latter, the pus forms a distinctly localized focus. It is generally admitted that a suppurative process may become localized in special regions, and Roberts has tabulated six regions where the pus may become localized, three being on the anterior aspect and three on the posterior aspect. This same writer even goes so far as to describe a symptomatology for each one of these groups. It should be pointed out, however, that these divisions are more or less theoretical and a classification based on the development of the perirenal fat seems to be more advisable. With Tuffier, I would divide perinephritic abscesses into retrorenal, suprarenal or subdiaphragmatic and infra-renal. When the abscess is seated above the kidney it is in relationship with the liver, the spleen and the diaphragm. Now, at this spot the subpleural tissue is in intimate relationship with the perirenal fat by way of the costolumbar hiatus and consequently it is easy to conceive how a perirenal abscess in this point may become supradiaphragmatic by direct extension of the inflammatory process, and can give rise to an empyema. When the abscess is seated below the kidney, it has a tendency to develop towards the pelvis, and in point of fact, the renal sac is open at its lower part, so that the pus can easily extend and invade the iliac fossa.

These two types of perinephritic abscesses should, it would seem, be found with great ease in children. In point of fact, it is at the upper and especially at the lower renal region that the fatty capsule has been found best developed, but if one reviews carefully the reported cases no mention is made of this particular fact. It is to be supposed that at the time these cases were operated on, the abscess had had time enough to involve the entire capsule and consequently the surgeon found himself in the presence of a complete abscess.

An abscess thus formed has a tendency to burrow outward at various points. The point of election is situated behind, where the abdominal walls are thin, and, in order to arrive there, the pus follows the blood vessels which perforate the aponeurosis of the transverse muscle. The abscess may also open into the pleural

cavity, or into the colon, but very rarely into the duodenum, peritoneum or bladder.

The contents of perinephritic abscesses varies according to the starting point of the suppurative process, as well as to the nature of the pathogenic organism present. In primary perinephritides, the pus is creamy and thick, but when the abscess is the result of a renal lesion, the pus is mixed with urine and it may contain calculi. In this case, the walls of the cavity are necrotic and the pus is grumous. If the abscess has a traumatic origin, there may be a more or less considerable quantity of blood mixed with the pus, and this phenomenon is observed when the suppurating process is opened soon after the occurrence of the traumatism. No matter what the location of the focus of suppuration may be, and even when it is not very near the digestive tract, the pus may have a bad odor, but, if the focus is in close proximity to the ascending or descending colon, the odor is most repulsive. For that matter, this applies to all abscesses developing in the neighborhood of the digestive tract. The fecal odor may be present without any opening into the intestine, or, on the other hand, there may have been an opening at some time during the process, but the latter has closed up and can no longer be found at the time of operation.

The bacteriology of perinephritic abscesses has not been extensively studied, but from our present knowledge, it would appear that the colon bacillus is the principal agent concerned in these suppurative processes, more particularly in children than in adults. Renal diseases in children not infrequently follow a colon bacillus infection and following gastro-enteritis, which is so frequent in children and especially in babies, the kidneys develop an inflammatory process, which reacts upon the perirenal fat; but it should also be pointed out that this bacterium has been found in the pus of perinephritic abscesses in adults. In cases having a traumatic origin the streptococcus, or staphylococcus would probably have been found more frequently had a bacteriologic examination been made.

As to the lesions produced in the neighboring viscera, it may be said that they are most variable. Those in close proximity to the focus of suppuration are involved, and this applies more particularly to the kidney itself. It should be pointed out, however,

that, although the kidney is frequently the cause of perirenal suppuration, the latter never involves the kidney itself. In other words, the kidney gives rise to a perinephritic abscess, but the latter never produces an intrarenal suppuration. In the same way the liver is never invaded by the pus from these abscesses, and, if an hepatic suppuration co-exists with a perinephritic lesion, the former is always primary and the perinephritic process secondary. The same cannot be said of the spleen, because the organ undergoes a sort of maceration, its structures become softened, while its parenchyma may be reduced to a pulpy mass. The pancreas may also be involved and suppurating peripancreatitides following perinephritides have been described.

The intestine may be adherent to the walls of these abscesses, and it may perforate, primarily or secondarily. In the former case fecal matter will be found in considerable abundance in the abscess, while in the latter, the perforation is small and may close up of itself. Influenced by the inflammation, the peritoneum reacts and becomes covered by false membrane, so that the pus of a perinephritic abscess only exceptionally opens into the peritoneal cavity.

I have been studying so far the extracapsular type of perinephritic abscess, and it now remains for me to say a few words as to the subcapsular type, which is much less frequent. As in the former, one may have multiple foci separated from each other, situated between the parenchyma of the kidney and its capsule, or on the other hand, there may be a single abscess cavity involving the entire kidney. Albarran has pointed out the importance of recognizing this subcapsular type of perinephritis and he mentions a case where it was thought that a pyonephritic sac had been opened when in reality the renal pelvis had not been reached and one was dealing with a subcapsular abscess.

In the etiology of perinephritic abscess we have to deal with predisposing and determining causes. The former are particularly dependent upon the anatomical formation and make-up of the region and depend upon the amount of fat contained in the perirenal tissue. It is probable that girls have a larger deposit of perirenal fat than boys and, in point of fact, abscesses in this structure are certainly more frequent in little girls. It should be pointed out that in adults the contrary holds true,—because males

are more frequently attacked by this process than females. Küster has collected 230 cases and showed in these statistics that the affection is twice as frequent in man as in woman.

Since of recent years puerperal infection has been practically done away with, males, in spite of the lesser development of the perirenal fatty capsule are more exposed than the female to perinephritis, and naturally traumatism plays an important part in the etiology of this affection. But in children, where girls and boys are about equally subject to accidents, the anatomical conditions of the renal region preserve all their value from the etiologic viewpoint, and the involvement of the perirenal sac by fat being more evident in little girls than in boys, the proportions are reversed.

A perinephritic abscess is rarely met with in babies, although Weber encountered it in the foetus, while Gibney has recorded one case in a child five weeks of age, and another has been published by Buscarlet in an infant of twenty months. It is nevertheless true that, in a large majority of cases, the children have been over five years of age. Arthritism, which plays such an important part in the formation of renal calculi must certainly be considered as a predisposing cause of perinephritis and many of these abscesses are in reality due to a renal fistula produced by calculi in the kidney, renal pelvis or ureter.

The classification of primary and secondary perinephritides is simple and comprehensive from the etiologic view-point, but certain considerations should be made in this respect. By the term primary abscess it should be understood that the suppurative process arises at once around the kidney and that it is not the result of an extension of an inflammatory process seated in a neighboring viscus. On the other hand, a secondary abscess owes its origin to a lesion of some organ, usually directly bordering on the kidney, or it may merely be the propagation of a neighboring suppurative process. Consequently, we should study the etiology of the primary abscess apart from a secondary abscess arising from some near-seated organ.

A primary perinephritic abscess may occur after an infected wound of the lumbar region, in which case one is dealing with a septicæmia, or, on the other hand, it may have as its etiologic factor a general infection of the organism. In this case bacteria, or their

toxins, are brought by way of the blood to the perirenal region. Many years ago Albarran very clearly demonstrated the latter mode of abscess formation. After having injected a culture of the colon bacillus or the staphylococcus into the ear of a rabbit, he caused a traumatism to the perirenal tissue and a suppurative process became localized at this point, which, in other words, was a point of lessened resistance artificially created. All the infectious diseases of early childhood, such as measles, scarlet fever, diphtheria, typhoid fever, smallpox, etc., may have a suppurating perinephritis as a complication. A case has occurred in my practice following typhoid fever in a child 6 years of age, Tuffier has also met with it in a child 7 years of age, while Lannelongue had a case following measles.

A simple operation on the external genital organs, an infection of the bladder, etc., have been known to result in a perirenal abscess, but, usually, one finds in the history of a case, well-defined causes, such as a trauma. The trauma is usually preceded by a collection of blood, which undergoes suppuration. The most peculiar thing about traumatism, a point which writers have not sufficiently insisted upon, is the considerable lapse of time which passes between the appearance of the inflammatory phenomena and the accident. The former sometimes do not appear before two or three months, or even one or more years after the trauma and this gives a particular aspect to these cases. Although many writers have referred to this fact, so far as I am aware no attempt at its explanation has been made. It may be that the influence of cold may explain a number of cases and to this I shall refer later on. The soil having been prepared by a former trauma, cold will act as a direct instigator for the production of the inflammatory accidents. Consequently, I believe that the combination of traumatism and cold may be considered in the etiology. Besides contusions of the lumbar region one should also include violent efforts, etc., and I believe that this cause has been admitted by a majority of writers. In this case, however, the perinephritic abscess develops some time after the accident. In these cases it is probable that a rupture of some muscle takes place, giving rise to an extravasation of blood, which, at a later date, undergoes a suppurative process.

Referring once more to the action of cold in the etiology of

these abscesses, I would refer to the experiments undertaken by Castets in 1896. He chilled animals by plunging them into refrigerating baths and after having left them for a certain time he found that a true intoxication arose which, according to him, was an autointoxication, having an intestinal origin, and he attributed this noxious action to the colon bacillus. He was led to believe that these bacteria entered the blood, and from this it was easy to conceive how cold acted on the production of infections, but, as has been pointed out by Albarran, it is difficult to understand why the infection should become localized in the perirenal capsule. As I have already pointed out I am inclined to believe that in those instances where the action of cold alone has been incriminated as the etiological factor, one would have found, if the history of the case had been more carefully gone into, that prior to this, some traumatism had been inflicted.

As has already been pointed out the suppurative process almost invariably occurs a considerable length of time after the trauma has been inflicted and, for that reason, patients and their relatives are likely to forget the occurrence of an accident some months before, and consequently attribute a chill or exposure to cold, which has recently taken place perhaps, as the cause of the abscess.

In the case of secondary perinephritis the kidney is the organ to be incriminated as giving rise to the process. Pyelonephritides have a particular predisposition to give rise to perirenal suppuration. In children, as in the adult for that matter, a pyelonephritis usually owes its origin to a renal lithiasis and it is well known that this affection is far from being infrequent in children, a point upon which I would especially insist as I believe that it is not generally recognized by the majority of physicians. Undoubtedly, it often passes by unnoticed and only gives evidence of its presence by some complication, this complication being not infrequently a perinephritic abscess. Renal lesions may extend to the fatty capsule surrounding the kidney, either by continuity or contiguity, but usually it is the latter, and, in this case, the extension of the process takes place by way of the lymphatics. By his very numerous experiments, Albarran appears to have demonstrated that the bacteria may pass directly through the fatty capsule by following the lymphatic tract or even into the renal pelvis.

Occasionally, the calculi located in the calices or in the pelvis give rise to an ulcerative process and the renal fistulæ resulting from this give rise to a perinephritic abscess. These fistulæ are more apt to be found on the posterior aspect of the kidney and through them the pus and urine invade the cellular tissue around the kidney, giving rise to the inflammatory process. These fistulæ may be quite large, at any rate sufficient to allow a calculus to escape into the perirenal fat, and it will then be encountered in the pus when the abscess is opened.

Whether or not tuberculosis of the kidney can give rise to an acute perinephritis is a question, and in most cases where this occurs one is most probably dealing with a mixed infection so frequently encountered in tuberculous urinary patients.

Perinephritic suppurations having as a starting point the gall-bladder or the intestine are the result of biliary calculi and very rarely of perforations of the colon, and it should be pointed out that usually the intestinal perforations found in these cases of perirenal abscesses are secondary rather than primary. The extension of pleuropulmonary infections to the perirenal fat probably occurs by way of the lymphatics and the veins going through the hiatus described by Farabeuf; and lastly let me mention appendicitis. All surgeons who have studied perinephritic abscesses have mentioned cases in the adult following a suppurative process in the appendix. For this reason it should be borne in mind that an appendicitis may have as a complication a perinephritic abscess in children, as well as in the adult.

From the clinical standpoint perinephritic abscess presents in its evolution three types which are quite distinct from each other, namely, a very acute type, an acute type and a chronic type. The first of these is due to the entrance of fecal matter into the perirenal fat, likewise urine, or foreign bodies coming from the kidney or intestine. When this eruption occurs, the local symptoms are hardly evident, but, on the other hand, the general symptoms immediately acquire a very exceptional gravity and death may rapidly supervene.

The acute form commences by symptoms of a general nature, followed by lumbar pain, and towards the tenth or twelfth day fluctuation can be detected. This type of perinephritic abscess is

more especially encountered following upon wounds of the lumbar region, with or without lesions of the kidney, or during the progress of infectious diseases. But by far the most frequent type is the chronic perinephritic abscess, and here usually a contusion is the etiological factor. This chronic form commences by what is usually mistaken for a lumbago. Now, as soon as an inflammatory process arises in the fatty capsule of the kidney, the first symptom complained of by the patient is a deep-seated, dull pain. If the child is sufficiently old to indicate the nature of his suffering, he will complain of a renal pain over the kidney and then in the iliac fossa, while at other times he will indicate its seat in the region of the false ribs or even in the scrotum. Thus, if the physician is not aware of the conditions which have preceded the appearance of the symptoms, the diagnosis will be doubtful, and, if it be also added that perinephritic abscesses are very uncommon in children, it is quite comprehensible that in the early evolution of the affection a diagnosis is impossible. The pain is increased by movement and by pressure over the lumbar region whether this be made from behind or through the anterior abdominal wall.

The commencement of the disease is accompanied by general symptoms, the first of which is a rise in temperature. This may be ushered in by a chill, the intensity of which is sometimes so great that it may be mistaken for the commencement of some acute infectious disease. After the chill the fever comes on and may last for several days, but usually it takes on an intermittent type with an evening rise. The condition of affairs may resemble malaria to a certain extent, but the absence of any effect from the administration of quinine would quickly exclude malaria.

The little patient reacts markedly from the local condition; the tongue is coated, the appetite disappears and vomiting occurs. The urine presents various characteristics according to the etiological factor of the perinephritic abscess. If this is due to traumatism the urine will be red, small in amount, but will otherwise present nothing of particular note. But if the abscess is due to some renal affection, one will find the same elements in the urine as those which existed before the development of the perirenal suppuration, that is to say, pus, blood or gravel. So far I have described the commencement of a chronic perinephritic abscess and, as far as the

symptoms are concerned, they may be summed up in two words, namely, pain and fever.

After this period of onset, which may be, in some instances, of quite long duration, a deep-seated tumefaction becomes manifest in the lumbar region and at this time spontaneous or provoked pain is very severe. All movements are impossible and, if, in order to examine the child, he is raised up by the arms, this manœuvre will cause him to cry out. In order to diminish the pain, the little patient will incline his body toward the affected side in order to relax the muscles. After a certain time this position, which has become practically permanent, may very closely simulate a coxalgia or a psoriasis. When this condition of affairs has lasted for a considerable length of time, the thigh may be flexed and abducted on the abdomen, and it is often impossible to reduce the limb on account of the pain to which the reduction gives rise. The maximum point of pain will be found in the lumbar region, but it may radiate towards the iliac fossa, the axilla, or the upper limb on the same side. This pain is readily explained by compression of the lumbar plexus. A tumefaction appears at this time and slowly increases in size and finally may fill the space existing between the false ribs and the iliac crest, so that an evident tumor may be seen in this region. A case of this description, which I published recently in the *St. Paul Medical Journal*, Feb., 1908, was perhaps a perinephritic abscess in a child three years of age, but as the incision was made anteriorly, and after careful exploration of the abscess cavity, no pathological condition could be found to explain the production of this extraperitoneal collection of pus, the paper was published under the title of "A Case of Extra-Peritoneal Abscess in a Child, with Remarks on the Pathology and Treatment of this Affection."

Bimanual palpation will at this time allow one to distinctly localize the tumefaction in the lumbar region, and in order to facilitate the examination, it is advisable to ask the patient to assume various positions. Some suggest placing the child on the abdomen and causing the thorax to bend forward, while other surgeons place the patient on the healthy side. In the latter position the intestinal mass drops away from the side of the lesion and its extent can be more easily judged. However, placing the patient

on the back with the thighs flexed is usually quite sufficient for making a deep palpation and, for that matter, no matter what position the patient is placed in, these examinations are always very painful and quite impossible to undertake in children who resist and cry, so that the simplest measure is to resort at once to anaesthesia.

The skin does not become changed for a considerable length of time and oedema only occurs late in the progress of the affection. The latter for that matter cannot be considered as a certain indication of an underlying suppurative process and it has been known to disappear spontaneously. Nevertheless, I am firmly convinced that the presence of oedema is of great diagnostic value, and when it is present the skin is in the first place rosy and later on takes on a reddish-violet hue. Finally, fluctuation can be detected, and in this respect it should be noted that the abscess runs through two stages which must be distinguished from each other. In the first, the purulent collection is walled off by the lumbar aponeurosis and the quadratus lumborum. It is then deeply seated and most difficult to feel. In the second period the pus has passed through the musculofibrous layer which walled it off and comes under the superficial layers. At this stage one is dealing with the so-called "collar button abscess," having two distinct foci, one deeply seated and subaponeuritic, the other superficial and subcutaneous. These two foci communicate with each other by a more or less extensive opening and by pressing on the tumor the pus in the superficial pocket may be pushed into the deeper one. To sum up, it may be said that, in the second stage of a perinephritic abscess, the four symptoms of inflammation are to be found, namely, pain, elevation of temperature, tumefaction and redness.

Sometimes, although, in truth, quite rarely, a perirenal abscess will end in resolution, but suppuration is the ordinary outcome. If one neglects to open it, the abscess will extend into different regions. The lumbar region is the point where the abscess is most likely to open and this takes place between the posterior border of the great oblique and the external border of the great dorsal muscles. In the next place it may perforate into the pleural cavity or the lung, in which case symptoms of an empyema or the vomiting of pus will show the location. When the former occurs, the outcome

is usually favorable, but a purulent pleurisy must be considered as a very serious complication, because the patient, already weakened by a long suppurative process, will with difficulty hold out against the new affection, so that death is usually the result. The purulent collection may also extend downward with ease. The renal sac being opened at its lower end and, as the fatty tissue of the renal region communicates directly with that of the iliac region, the purulent collection following the laws of gravity has a natural tendency to extend downward towards the pelvis. It may point either in the inguinal region or the buttocks, according to whether or not it respects the iliac aponeurosis. The abscess rarely opens anteriorly, and, as I have already pointed out, the peritoneum, reacting against the neighboring inflammatory process, becomes lined with false membrane, so that the pus rarely breaks through this barrier. However, if it works its way through, a fatal peritonitis is the natural consequence. The purulent collection may also open into the stomach, or at some point in the digestive tract, such as the duodenum or colon. This always results in a very serious prognosis.

Perinephritic abscesses often terminate in fistulæ, the direction and persistency of which are due to the special arrangement of the perirenal fatty tissue, and it would appear that the larger amount of perirenal fat present at the two ends of the kidney and on its posterior aspect explains why the fistulous tract is usually multiple. It is probable that there are always secondary tracts ending in those points where there is a larger amount of fat.

Even in adults the diagnosis of perinephritic abscess in its beginning is of extreme difficulty and nevertheless it is during the initial period that it is important to make a diagnosis in order to incise the purulent collection before the pus has had time to burrow in various directions. In the child, for apparent reasons, the diagnosis is surrounded with almost insurmountable difficulties, especially at the commencement, when all indication of any etiological factor is wanting. Now, in point of fact, when the abscess follows an affection of the kidney, or of some abdominal viscus, one may suspect a perirenal suppuration as soon as pain and a rise in temperature manifest themselves. But when the abscess occurs without any appreciable cause, or when this cause dates back to

traumatism inflicted several months previously, before the appearance of the pain, it is quite impossible to take in the situation of affairs with any degree of accuracy. Having said this much, let us examine in what cases one is called upon to make a diagnosis and in each of these what affection one must differentiate from a perinephritic abscess.

If there is no tumefaction the symptoms are merely pain in the lumbar region and a rise in temperature. Consequently, all diseases capable of producing pain in the lumbar region can be suspected, such as lumbago, some of the exanthemata, especially smallpox, and typhoid fever. Now, lumbago does not give rise to fever, it is generally bilateral and pressure over the painful spot will give rise to pain on both sides of the vertebral column, while in perinephritic abscess the pain is only present on the affected side. In lumbago the pain is more superficially seated than is the case with abscess, and is not accompanied by that sensation of weight that is complained of in cases of a deep-seated perirenal abscess. But this differentiation, which is possible in adults who can explain their symptoms correctly, is practically impossible in children, and usually the diagnosis of lumbago, or the phenomena of growth are the diagnoses commonly made by the physician. As to iliolumbar neuralgia it may be said that it is easier to diagnosticate, because there are in this affection special painful points over the exit of the nerves, and pressure will elicit pain over these points and only there. For the acute exanthemata, the diagnosis will not be hesitating for any length of time, because the evolution of these affections is rapid and, on the other hand, the temperature chart in no way resembles that found in a perinephritic abscess.

Now, when a tumefaction exists, it is above all with renal diseases that a suppurating perinephritis may be mistaken and, consequently, I shall rapidly consider certain lesions of the kidney which have several characters in common with the affection which we are considering, and, in the first place, I would refer to acute nephritis. This disease is accompanied by pain, fever and tumefaction, all of which symptoms are encountered in a perinephritic abscess. But in nephritis the pain is constant, while the elevation of the temperature has not the intermittent character that it assumes in perinephritis. The tumefaction is not pronounced and not

infrequently it is completely wanting, while in all cases of acute nephritis, oedema and fluctuation are absent.

The differential diagnosis with pyonephrosis is very difficult, but whether or not one is dealing with a pyelonephritis, or some renal neoplasm, the diagnosis should be made, based on the following law, namely, *a pyelonephritis is an abdominal tumor, while a perinephritic abscess represents a lumbar tumefaction*. And what is more, a pyonephrosis never involves the skin, while a perinephritic abscess is quite frequently followed or accompanied by an oedema of the subcutaneous fat of the lumbar region. A pyonephrosis is a rounded tumor, presenting a very distinct ballotement in most cases, while the inflammatory infiltration of a perirenal abscess is flattened and immovable. When a pyonephrosis and a perinephritis occur together, and this is not an infrequent occurrence, the former gives rise to perinephritis and it is difficult to recognize the perinephritic inflammation in this case. The chronic progress of a hydronephrosis, occasionally the very large size of the tumor, the absence of a rise in temperature and the freedom from pain on percussion, are sufficient signs to differentiate it from a perinephritic abscess.

In children malignant disease of the kidney, usually met with in the form of sarcoma, is not often accompanied by pain and hæmaturia, which, in the adult, announce the development of a malignant renal growth. In the child, the most constant and distinct symptom is an increase in the size of the kidney and for this reason one may hesitate in the diagnosis between malignant disease and abscess. But in cancer the child rapidly undergoes cachexia and at no time during the evolution of the affection is fluctuation present.

Tumors of the intestine or spleen, aneurism of the abdominal aorta, tumors of the liver or the gall-bladder, present certain symptoms which are also encountered in a suppurating perinephritis. It is not my intention to discuss the differential diagnosis of these affections, and I would merely repeat that *all these tumors are seated in the abdomen, while a perinephritic abscess is limited to the lumbar region*. It is quite true that certain affections, although very rare, may develop in the lumbar region, one of which is a lumbar hernia, but palpation and percussion will settle the diag-

nosis. A tuberculous abscess of this region resembles a perinephritic abscess, but the absence of general symptoms makes the differential diagnosis easy. When the abscess has extended beyond the perirenal fat, it may simulate other affections, which I will now consider.

One of the symptoms of a perinephritic abscess, as I have already pointed out, is flexion of the lower limb corresponding to the diseased side and this may cause an erroneous diagnosis of psoriasis. There are, however, certain symptoms which will allow one to differentiate the two diseases. In psoriasis the flexion of the lower limb is more accentuated than in abscess, pressure over the iliac fossa is painful and only slight in the lumbar region, where it is more particularly exaggerated in cases of perinephritis. In psoriasis the pus points in the femoral region and towards the small trochanter, while such an extension is very exceptional in the case of perirenal abscess. In psoriasis there is never any tumefaction nor cedema in the lumbar region. When the pus extends towards the pelvis from a perirenal abscess, it may lead to an erroneous diagnosis of pelvic suppuration. Consequently one should always bear in mind in operations necessitated on account of a pelvic suppuration, the possibility of an extension of pus from a perirenal abscess and methodically search for this possibility.

We have so far considered the diagnosis of a total perinephritic abscess, that is to say, one which has involved the entire fatty capsule and its difficulties have been pointed out, but when the abscess is partial, suprarenal or infrarenal, the diagnosis becomes still more complicated. In the case of suprarenal abscesses, the symptoms are so obscure that usually the diagnosis is only made at the time of operation. Before this is undertaken the case is usually considered one of subphrenic abscess or a pleural empyema, and I would point out that, in children, a purulent pleurisy will frequently simulate a perinephritic abscess. Now, in pleurisy, the liver is pushed downward, a condition of affairs which does not occur in a perinephritic abscess. A subphrenic abscess frequently contains gas and this is really the only sign with which I am familiar that allows one to recognize it.

The prognosis of perinephritic abscess naturally varies according to the etiological factor and the progress of the affection. In

primary perinephritis the prognosis rests with the surgeon, because everything depends upon the rapidity with which the operation is undertaken. If the diagnosis is quickly made, if prompt issue is given to the pus, before it has time to extend in other directions, the prognosis is relatively good and a cure results by operation. On the other hand, if the affection arises in a child whose general condition is bad, or if there is any hesitancy about operating, the prognosis is not so good. In the first case the patient cannot expend the strength necessary to combat the suppuration, while in the second, the purulent extension may take place towards the iliac fossa, the inguinal region or to neighboring viscera.

In secondary nephritis the condition of the kidney usually controls the situation. For example, when a perinephritic abscess is produced by a lesion of the kidney, such as renal calculus, the prognosis is extremely serious and it is here that the very acute type is met with. But when the evolution of the affection is less rapid and the starting point is from a lesion of the kidney, the prognosis is nevertheless serious. No matter what the treatment may be, the primary etiological factor still persists and keeps up the suppurative process. Ordinarily, fistulæ occur which last for a very long time and necessitate further surgical interferences.

Medical treatment of perinephritic abscesses is now a thing of the past and surgical treatment, rapidly undertaken before the pus has broken through the aponeurosis, is the only proper treatment. The incision should be made over the point where fluctuation is most distinct and usually this will be found at the external border of the lumbar mass of muscles. A transverse or longitudinal incision have both been advocated, but in the present state of our knowledge, I prefer one starting from the last rib, carried along the border of the quadratus lumborum towards the iliac crest. This incision I believe is less likely to result in a lumbar hernia later on.

No matter what incision is made, one should never lose sight of the fact that the abscess may be of the "collar button" variety and should this be the case the opening between the two abscesses must be freely enlarged so that good drainage of the deeper abscess may be obtained, otherwise a fistula will result. When the abscess has been emptied one should carefully explore the cavity and then examine the kidney and the neighboring viscera. To facilitate this,

one hand should be placed on the anterior abdominal wall and enough pressure made to push the organs towards the lumbar wound. If an intrarenal suppuration is found, a free nephrotomy should be done.

After all the pus has been emptied a large drainage-tube should be introduced which will shorten gradually as the wound fills with granulations.

One of the most difficult things to decide, when considering the operation, is the proper interference when the purulent collection has broken into the bronchial tubes or intestine. In the former, a spontaneous cure is not infrequent and one may temporize, but, in the second case, the surgeon should be guided by the condition of the patient. If the pus is drained off by way of the gut, if the general condition remains good, an operation is not necessary, but if, on the other hand, the suppurative process gives rise to serious symptoms, such as cachexia, and if there is an elevation of temperature coinciding with the retention of pus, an incision should be made of sufficient size to secure perfect drainage, so that the visceral fistula can close.

THE SYMPTOMS AND DIAGNOSIS OF CANCER OF THE LARGE INTESTINE

BY P. LOCKHART MUMMERY, F.R.C.S.,

Hon. Surgeon King Edward VIIIth's Hospital for Officers, Assiat. Surgeon
St. Mark's Hospital for Diseases of the Rectum and The North
Eastern Hospital for Children

WITHIN recent years very great improvements have taken place in the operative treatment of cancer of the large bowel, and instead of patients dying with unrelieved obstruction or dragging on an often miserable existence for a few months with a colotomy, numerous cases have now been reported in which the growth has been successfully removed and the continuity of the bowel restored.

There is, however, one necessary essential to successful operative treatment, and that is early diagnosis of the lesion. The chief hindrance to operation is the fact that in the vast majority of cases the diagnosis is not made till it is too late for there to be any hope of successfully removing the growth. It is in many ways an unfortunate fact that cancer of the colon usually gives rise to but few symptoms in the early stages. And, unless great care is taken in examining patients who complain of bowel symptoms, the diagnosis will not be made until actual symptoms of obstruction occur, by which time, in most cases, the growth has progressed too far for complete excision to have a fair chance. In fact, the successful treatment of cancer of the colon, as indeed of cancer elsewhere, depends principally upon early diagnosis, and I shall attempt in this paper to bring forward a few points which I trust may aid in the early diagnosis of these lesions.

When a cancer of the colon has advanced to the stage at which it commences to cause obstruction to the bowel lumen, the symptoms are as a rule readily recognized and there is not much difficulty in making a diagnosis, but, unless we are content to do nothing more than tell our patients when they are going to die, this is not sufficient. And we want to be able to recognize the presence of cancer in the large bowel at an earlier stage.

The first thing that we must know is obviously what symptoms should make us suspicious of cancer in the large bowel. Once we have got so far as to be suspicious of the presence of a growth in the large bowel, it then only remains to apply special methods of diagnosis to confirm or refute our suspicions. But the most important step is to know when these methods should be applied.

Early Symptoms of Cancer of the Colon.—One of the earliest symptoms of cancer of the colon is a sense of discomfort in the abdomen—often not amounting to actual pain—coming on from one to two hours after a meal. Often this is very indefinite. The patient says that at some time after a meal he feels a sense of weight and fulness in the abdomen. At other times it is more definite, and he will tell you that an hour or two after meals he has colicky pains localized to some particular part of the abdomen. Occasionally when the growth is in the sigmoid flexure, the patient will say that the pain comes on before going to stool and that at other times he is free from pain or discomfort.

The pain complained of in cases of cancer of the colon varies very considerably. In some cases it is referred to the lower part of the back and may easily be put down to lumbago. In one of my cases of cancer of the sigmoid flexure the chief complaint of the patient was of a constant dull pain across the upper part of the sacrum. When the pain is in the abdomen it is often stated to be of a dull dragging character. Careful enquiry will generally elicit the fact that it is aggravated by the ingestion of food or by defecation. My colleague, Mr. Furnivall, recently saw a patient at St. Mark's Hospital who complained of pain in the left groin and hip-joint; there were a few bowel symptoms in addition, and a sigmoidoscopic examination was made with the result that a polypus was discovered in the sigmoid flexure. Of course such symptoms may result from many other conditions besides cancer, but they should make us suspicious and should lead to a thorough and careful examination, more especially when associated with any of the other symptoms I am going to mention.

Diarrhœa is a common early symptom of cancer of the colon and is often most deceptive. Often the diarrhœa only occurs occasionally, and may then readily be attributed by the patient to some error of diet. When a patient, especially an elderly patient,

complains that during the course of a few weeks or months he has had several attacks of diarrhoea without any very definite cause, we should view the case with grave suspicion. Slight diarrhoea on first rising in the morning is a symptom which should always give rise to a suspicion of cancer of the bowel. The fact that the diarrhoea is readily stopped by taking some simple astringent medicine is no reason to exclude cancer as a possible cause. Chronic diarrhoea, with but few exceptions, is due to some lesion of the large bowel, and in elderly patients one of the commonest causes is cancer. Chronic diarrhoea in such a patient is a most suspicious symptom, and the fact that it is readily stopped by the administration of suitable drugs should not be allowed to allay suspicion as to the true cause.

The diarrhoea is never copious, but is of the characteristically irritative type. The stools are frequent and small in amount, often consisting of little more than an ounce or so of slime or watery discharge mixed with a little fecal material. Another common character of this form of diarrhoea is that it is frequently accompanied by an inability to retain the bowel contents for more than a few minutes. Thus the patient will tell you that he is obliged to seek the nearest lavatory directly he feels a call to stool. The real condition in fact is not diarrhoea, but constipation. The diarrhoea is spurious, and on careful enquiry and examination we find that the patient has not really passed a proper quantity of fecal material for a considerable time, in spite of the fact that the bowels may have acted in this spurious manner several times a day.

Mucus in the stools is often an early symptom of cancer of the colon. It is almost invariably accompanied by a certain amount of diarrhoea or looseness of the bowels. I have seen several cases of cancer of the sigmoid flexure in which this was the only symptom, a sigmoidoscopic examination disclosing the presence of the tumor. Mucus in the stools of course frequently occurs from other conditions beside cancer. The mucus may be in the form of definite mucous casts which are often supposed to be characteristic of membranous colitis, and I have seen two cases of cancer of the colon in which such typical casts were passed.

Blood in the stools, especially when the blood is intimately mixed with the feces, is always a significant symptom, but unfor-

tunately it is often entirely absent or does not occur until quite late in the progress of the case. I have, however, recently operated on a case where the only suspicious symptom was a sudden and severe hemorrhage from the bowel on two occasions with about a week's interval. The growth in this instance was situated in the lower end of the sigmoid flexure.

Bleeding from the bowel is a common and often early symptom of cancer of the rectum, owing chiefly to the fact that the bowel is fixed and traumatism from the passage of fecal material readily occurs, giving rise to ulceration of the growth at an early stage. In cancer of the more mobile colon, however, traumatism does not so readily occur, and chiefly for this reason blood in the stools is a much less common symptom of cancer of the colon. Although blood in the stools is not common when the stools are examined in the ordinary way, it can often be detected if a microscopical examination of the feces is made. The presence of a tumor in the abdomen can seldom be an early symptom of cancer of the colon, and a diagnosis which is made from the discovery of such a tumor will in many cases be too late for the best chances of operative interference. There are cases, however, where the growth remains localized for a long period, and in such the detection of a tumor may be the first sign of the disease.

Constipation is not infrequently the earliest symptom of cancer of the colon. Constipation is, however, such a common condition apart from cancer of the bowel that it loses much of its value in diagnosis. When, however, we see a patient—especially an elderly patient—who has begun to suffer from troublesome constipation quite suddenly, and who has hitherto been quite free from any difficulty in getting the bowels to act, we should be very suspicious of the cause, more especially if the constipation alternates with diarrhoea.

A sudden attack of chronic or subacute obstruction of the bowel in a patient past the middle period of life should always give rise to a serious suspicion of malignant disease of the colon. Such an attack will often be accompanied by severe colicky pains and perhaps vomiting. It may pass off quite readily after the administration of a dose of castor oil or an enema administered with the long tube, but we should be suspicious as to the cause, as not infrequently

it will be found to have been due to a small growth in the bowel. In such cases the bowel is not obstructed by the growth—which may be quite small—but the colon at this spot is in a hypersensitive and irritable condition, and this added to the slight resistance to the passage of solid fecal material caused by the growth is sufficient to cause a fecal impaction at this spot. A year ago I saw a case which well illustrated this condition. The patient was an elderly gentleman who consulted his doctor on account of constipation. For some weeks he had had unusual difficulty in getting the bowels to act. On examination the doctor discovered that there was a movable mass in the left iliac fossa, and the administration of an aperient did not get rid of this mass. The patient's doctor suspected cancer although there was no other symptom of importance. I saw the patient with a view to making a sigmoidoscopic examination and if possible clearing up the diagnosis. Previous to my examination castor oil was administered and several enemata were given. I was unfortunately unable to make the examination owing to the rectum containing liquid fecal material, but we found that the mass which had previously been discovered had entirely disappeared, and came to the conclusion that it had been a mass of impacted feces which the oil and enemata had dislodged. We nevertheless still suspected a malignant cause for the condition and advised that the sigmoidoscopic examination should be carried out after the bowels had been further emptied. The patient, however, was so convinced that we were making an unnecessary fuss about nothing that he refused further treatment and was lost sight of. I have recently heard that nearly a year later he developed acute intestinal obstruction, and colotomy had to be performed for an inoperable cancer of the sigmoid flexure. It seems more than probable that had the examination been carried out as we recommended, we should have detected the growth at a stage when it could have been satisfactorily removed.

It is well to remember that fecal impaction does not occur apart from some lesion of the colon or rectum, except in schoolboys and gross feeders, and careless persons who habitually suffer from severe chronic constipation. Fecal impaction occurring in an otherwise healthy individual who has not committed gross dietary indiscretions is usually due to an obstructing lesion of the bowel.

Once a suspicion of a growth in the colon has arisen, the next important step, and one which should never be omitted, is to make a careful examination to confirm or negative the suspicion.

Examination of the Patient.—This may be divided into three headings, all of which are important:—

Examination per rectum;

Palpation of the abdomen;

Examination of the stools.

It is first of all essential to get the bowel empty as far as possible, as not only will this facilitate the rectal examination, but it will also render abdominal palpation much easier. A good purge, such as castor oil, should be given, and if this does not act well it should be followed by a dose of salts next morning.

It is of course not possible to feel directly a growth in the colon or sigmoid flexure by a finger in the rectum, but a bimanual examination with a finger in the rectum and the left hand on the abdomen will often enable a growth in the sigmoid or cæcum to be felt through the bowel wall. Another useful method of examination is to pass a finger into the rectum while the patient assumes a squatting attitude and strains down. In this way I have on several occasions been able to feel growths in the sigmoid flexure through the anterior rectal wall.

By far the most important and valuable method of examination, however, is by means of the electric sigmoidoscope, and whenever possible this method of examination should be utilized. It enables us readily to examine the greater part of the sigmoid flexure, and as nearly three-fourths of the growths of the colon are situated in this area of the bowel, it goes a very long way in enabling a certain diagnosis to be made. Moreover, since it causes no pain and but little discomfort and does not necessitate an anæsthetic, it can be used in doubtful cases without putting the patient to any great inconvenience. Like all special instruments, it is, however, of but little use in unskilled hands, and may even be a source of danger if carelessly used.

For palpation of the abdomen, the bowels should have previously been well cleared. The patient's head should be supported on a pillow and the knees should be drawn up. The palpation should be carefully and methodically carried out, the colon being examined

in its entire course from the cæcum to the rectum. Palpation must be carried out gently to be effective, as sudden or severe pressure will invariably defeat its object by causing contraction of the abdominal muscles. Deep palpation is greatly facilitated by making the patient take a deep breath and then pressing slowly and deeply as the muscles relax during expiration. Special attention must be paid to the splenic and hepatic angles and to the cæcum and sigmoid. In palpating the sigmoid flexure the fingers should be pressed well down into the pelvis behind the pelvic brim during successive expirations.

Examination of the Feces.—This method of examination has been much improved and elaborated recently, and is of very considerable value if properly carried out.

An ordinary macroscopical examination of the stools should first be made, and for this purpose it is advisable, first, to examine an ordinary stool, and then to examine a stool after a smart purge has been administered. A few ounces of this latter stool should be placed in a bottle with some formalin for subsequent microscopical examination. No importance whatever can be attached to the size or shape of the feces, but it is important to notice the presence or absence of blood or mucus or any other abnormal constituents. As a rule it is advisable to entrust the microscopical and chemical examination to a clinical laboratory or pathologist. A microscopical examination should be made for blood corpuscles, pus cells, epithelium, etc. There are several fairly reliable chemical tests for blood in feces which should also be used. Some pathologists have gone so far as to state that microscopical or chemical evidence of blood in the feces is always present in cases of cancer of the colon. At any rate it would seem quite certain that the presence of blood in the feces can be demonstrated in many cases in which there is at no time any macroscopic evidence of its presence. The mere presence of blood in the feces is of course not direct evidence of cancer, but it certainly shows the presence of some ulcerative lesion, and is an important piece of evidence.

Lastly, in difficult cases where a positive diagnosis cannot be made, but where there is a serious suspicion of cancer of the colon, an anæsthetic should be given. Under an anæsthetic palpation can be more effectively carried out, and by passing two fingers into the

rectum and making a bimanual examination, it is usually possible to feel any growth in the pelvic portion of the colon or in the cæcum. Lastly, in difficult cases the advisability of an exploratory laparotomy must be considered.

Differential Diagnosis.—Apart from actual evidence of the position of the growth, such as may be obtained by palpation or sigmoidoscopy, some idea of the position of the growth may often be obtained by a study of the symptoms.

Growths in the sigmoid flexure or descending colon are those which most commonly cause diarrhoea or constipation, and the pain which they produce is usually referred to the sacrum or left loin. This may bear a definite relationship to the action of the bowels. Bleeding is also more likely to occur than in the case of growths in the higher portions of the colon.

In cases of cancer of the cæcum, the pain or discomfort usually bears a definite relationship to meals, often coming on from one to two hours after a meal, corresponding to the time at which food reaches the cæcum. The pain is also more often of a colicky nature. The pain in cancer of the cæcum is often referred to the right leg or testicle and may closely resemble the pain in chronic appendicitis.

The symptoms and signs of cancer of the colon are those referable to a local obstructive or ulcerative lesion, and the actual evidence of cancer is presumptive, even when positive evidence of a lesion has been found, except when the growth has actually been seen by sigmoidoscopy. It is therefore, as a rule, impossible to be certain that the lesion is cancer though the probabilities of its being so are considerable. There are certain other lesions of the colon which so closely resemble cancer that a differential diagnosis is seldom possible at the present time. The most important are tubercle and localized pericolicitis. Either of these may give rise to a tumor in connection with the colon. Localized tuberculosis of the colon or hyperplastic tuberculosis of the colon is almost invariably mistaken for cancer, and most of the cases of cancer of the colon which have disappeared after such operations as short-circuiting or simple laparotomy were probably of this nature.

Hyperplastic tuberculosis of the colon is not as a rule accompanied by much ulceration and often by none, so that the most careful examination would not enable tubercle bacilli to be demonstrated

in the feces, and the only possible method of making a correct diagnosis would seem to depend upon finding definite evidence of tubercle in some other organ. Fortunately the mistake would not be a serious one as this form of intestinal tuberculosis tends to cause a serious degree of stricture for which operative treatment is in any case called for.

Pericolicitis is of course accompanied by the usual symptoms of chronic inflammation, but this does not aid us much in distinguishing it from cancer, as cancer when it attacks the bowel is not uncommonly the cause of local inflammation and abscess. A differential diagnosis between pericolicitis and cancer is therefore very difficult, if not impossible, in most cases, but again this is not of much importance as operation will be the only treatment in either case. It may happen, however, that a patient with pericolicitis may be allowed to die from sepsis or perforation under the impression that he is suffering from an inoperable cancer, when an operation to establish drainage or to short-circuit the affected bowel might have enabled him to recover. It is advisable therefore to bear the possibility of pericolicitis imitating cancer in mind, more especially in young subjects; as pericolicitis from simple ulceration is most common in much younger patients than those who usually suffer from cancer.

Lastly, a diagnosis of cancer of the colon having been made it will be necessary to consider whether an operation for its removal shall be undertaken. This will of course depend upon the size and connections of the growth, and also to no small degree upon the general condition of the patient, his age, the condition of his kidneys, lungs, and so on.

It may now be said that, other things being favorable, there is no part of the colon which cannot be successfully excised and the bowel restored, providing that the growth is not too large or too fixed. Where the growth is inoperable, but is so situated that the bowel can be short-circuited, great increase in comfort and considerable prolongation of life may be expected from this procedure, which, though not so safe an operation as colotomy, is vastly preferable from the aspect of the patient's subsequent comfort.

TREATMENT OF VARICOSE ULCER AND VARICOSE VEINS OF THE LEG *

BY ARGUS D. WILLMOTH, A.M., M.D.

Professor of Surgery and of Clinical Surgery in the University of Louisville,
Medical Department, Louisville, Kentucky

GENTLEMEN:—The case before us I regard as one of especial interest, not because the condition presented is so rare as to be seldom encountered, but exactly the reverse; the case belongs to a class that you will not infrequently see in your practice, and therefore I say it possesses uncommon interest.

The patient, a male, aged forty-eight years, occupation butcher, tells us that the large open sore which we see on his right leg between the ankle and the knee has existed for over two years, that he fell and struck this leg against the curb-stone making a slight abrasion, extending only through the skin, from which the condition as we observe it to-day developed. As you can plainly see there is an extensive varicosity of the veins of this leg, and the sore is one frequently seen under such circumstances,—a varicose ulcer of the leg. He does not remember when he first noticed the varicose veins on this leg, but says it has been several years.

From your studies of the subject you will recall that varicose veins of the lower extremities are quite common, and also that it is the long saphenous veins which are usually involved in the process. You will remember that in varicosity there is first an enlargement of the vein, owing to loss of elasticity, permitting a damming back, so to speak, of the circulation, resulting in passive hyperæmia with so-called chronic inflammation which is not really an inflammatory condition but a hyperæmia of the limb due to enlargement of the veins and consequent impairment of the circulation. Owing to enlargement of the veins the valves do not properly fit, and there results a stagnation or accumulation of blood in the veins causing their further enlargement. This is easily demonstrated in cases of

* Clinical Lecture delivered at the University of Louisville Medical Department.

this kind after enlargement of the veins has taken place. By putting your finger, for instance, on the saphenous vein, when it is very much enlarged, you will find that the vein below, notwithstanding the pressure of your finger, does not become larger, showing that the blood from behind only fills the vein to a certain extent; then if you will remove your finger releasing the pressure you will find the column of blood from above descends and causes much greater enlargement of the vein, showing that the varicosity is largely due to the weight of the column of blood.

We find that the patient before us also has some enlargement of the deeper set of veins, that not only are the superficial veins enlarged but there is also involvement of the deeper vessels, resulting in a general varicosity. In many of the cases where both sets of veins are involved, in addition to the hyperæmic condition of the limb you will also find there is marked œdema, an extravasation of serum into the tissues, which in this situation gives a very hard marble-like œdema that is totally unlike the œdema observed in other parts of the body. In addition there is oftentimes more or less discoloration. The change in color is due in most instances to destruction of the superficial lymphatic vessels and the superficial veins of the skin, even those perhaps immediately underneath the skin, and an extravasation of blood into the cellular tissue takes place. This usually occurs in all typical cases where there is an ulcer. The extravasation may be sufficient to make the color a dark purple. This means, of course, in most instances, that there has been bursting of a small vessel with extravasation of blood resulting in so-called ecchymosis under the skin which makes the leg dark blue or purplish, resembling in color beginning gangrene.

Varicose veins may be the result of many things: It is believed by some observers that heredity plays a large part in their production, since the condition is common in certain families, that even the same veins may be involved in several members of the family, looking as if they inherited a lower resisting power of the vessel walls which caused them to undergo certain changes resulting in varicosity; but it is questionable whether heredity has anything to do with production or causation. Occupation seems to be a prominent factor in bringing about a varicose condition of the veins of the extremities. It has been conclusively shown that varicose veins

are much more common in women than in men, because of pregnancy, abdominal tumors, etc., obstructing the return of the venous blood. Again the tight garters which women wear about the limbs obstruct the venous return and oftentimes act as a cause of varicose veins.

After the veins once become enlarged, it can readily be understood that the valves are too small to be of much assistance in supporting the column of blood above, the vessel wall has also lost its normal elasticity and does not close down as it were on the blood which it contains, consequently there is always an accumulation of blood in the veins. There results an cedema which may be more or less extensive, an atheromatous condition of the vessels is not uncommon, an accumulation of fibrin from the blood occurs, and as this continues a deposit of calcium and potash takes place so that there results the formation of what are known as vein stones or phleboliths. Where there is a knotty and tortuous condition first, as you will see in some cases, a great number of these vein stones may be formed. The vessel becomes completely obstructed, fibrin continues to be deposited, and after a while by passing your fingers over the leg you can detect a large number of these phleboliths which feel like split pears under the skin. If these vein stones form in sufficient number to obstruct completely the enlarged vessels, they may bring about a permanent cure of the varicosity, which may be quite as effectual as an operation, in which an attempt is made to obliterate the veins or prevent any further circulation of blood in them by ligation. On the other hand, the veins may become infected and a suppurative thrombophlebitis may take place.

As a rule varicose veins do not give the patient a great deal of pain or distress. Patients may present very large varicose veins that give little or no trouble or discomfort; occasionally, one may see patients with only slight varicosity who will complain of severe pain in the leg, inability to stand on the feet for any great length of time, and other discomforting symptoms. Railroad clerks, men who do desk work and are not allowed stools on which to sit, or those who constantly labor in a standing position, not infrequently have small varicose veins which give them some pain that they believe to be rheumatic in character. These individuals will present themselves to you for treatment because of that pain. They will be sur-

prised when you tell them that they have varicose veins, and that the pain from which they have suffered is not due to rheumatism. While this is true in many cases in the male sex, it is particularly true of women. I have known of many women who had an extensive varicose condition of the veins of both lower extremities, yet they made not the slightest complaint on that account. As I have already indicated varicose veins in women, more often than otherwise, follow pregnancy, and women appear to think them a natural consequence, one of the many things they have to suffer, as a result of pregnancy and childbirth. They may go along through the balance of their natural lives in this way, without making any complaint, unless complications arise which cause them to seek medical aid.

One of the commonest complications which occur as a result of obstruction to the circulation in the extremities is an eczema. In many instances, especially in women, relief is not sought because of the varicosity, but because of the eczema which complicates the condition. There is first a hyperæmia due to the lowered vitality of the tissues, this lowers the resisting power, then an eczematous condition of the skin makes its appearance. That is what occurred in the case before us. Finally there was engrafted upon this eczema another condition, viz., an ulcer. This man has a very large circular ulcer of the leg at the junction of the lower with the middle third. Ulcer nearly always follows the development of eczema in these cases. You may find, however, as in the case before us, that the ulcer follows immediately in the wake of an injury, a simple abrasion of the skin is sufficient to cause the formation of an ulcer. The probability is that this man would have had an ulcer at some time or other, whether he had injured his leg or not, as that is the history of the majority of such cases. There is always extensive irritation of the skin from the eczema as a result of the discharge which takes place, and this in itself is sufficient to induce the formation of an ulcer.

At the time this patient came to me for treatment the ulcer was at least three inches in diameter; the ulceration was of the usual type that you will see in this class of patients; it extended half the way around his leg; he had an enormously swollen leg and foot of the bluish or purplish color that I have mentioned; the leg was

covered with an incrustation from the eczema; the ulcer was of the typical indolent, dirty type that is commonly observed in this class of cases; the entire surface of the ulcer was covered by a dirty membrane or discharge not unlike the membrane seen in a diphtheric throat, except that it was darker in color; the edges of the ulcer were of a callous nature showing that the healing process was markedly retarded, that the normal process of healing was impossible under existing circumstances. That was about the man's condition when he first presented himself to me for treatment.

As to the treatment of these cases: we will first consider the question of varicose veins, then the complications which may arise. If a man or woman came to you with varicose veins, naturally the first thing that would occur to you in the way of treatment would be something to support the walls of the veins, thereby adding to the strength of the vessels and preventing damming back to the blood supply, which would also prevent œdema and other complications which almost necessarily follow in the wake of œdema. You would naturally think of some sort of bandage to the patient's limb to support the circulation. Such an application makes an ideal treatment in many cases. The patient does not come to you for radical treatment, he wants simply palliation, because he says the varicosity does not give him any great amount of trouble, and therefore does not care to submit to any radical operative procedure for relief.

The simplest palliative measure is some form of bandage. There are several kinds of bandages by which adequate pressure can be secured. The ordinary cotton bandage is one of the cheapest and best at our command. Next to this perhaps for use at all seasons of the year is the flannel bandage. These bandages are cheap and can be easily applied. You can soon teach the patient himself how to apply them, *i.e.*, to put the bandage on when he gets out of bed in the morning, and take it off the last thing before going to bed at night. He can envelop the leg from the toes to above the knee with this bandage every day. Enough of the material should be secured at one time so that he can have several changes. In this way he may go through life wearing the bandage without any great amount of trouble, as he can learn to adjust the bandage properly

himself. Oftentimes results are good from this method of management.

In considering the treatment of these cases in a palliative way we must not forget the rubber bandage, either the Esmarch, or the rubber stocking. At the first glance the rubber stocking would appear to be the ideal treatment, since the patient can slip it on in the morning and off at night, there being no trouble in applying either a rubber bandage or a rubber stocking; the objection to all rubber bandages or rubber stockings is that by their use you prevent evaporation of moisture from the skin, you start just what you do not want, there is maceration of the skin with possibly infection engrafted thereon, and the result is in a short time that there is started an irritation of the skin, an eczema, so that you produce, as a result of the rubber stocking or bandage, the very thing that you are trying to prevent. This is the trouble with all rubber stockings and rubber bandages. In the winter time, however, if the patient will wear the rubber over a white stocking, no harm will likely be done; but rubber is not to be thought of during heated seasons of the year.

There is a stocking that I would like to recommend for this purpose which will permit of evaporation and is adapted to all seasons of the year, one which I regard as the best of the palliative measures: *i.e.*, if the patient has the money he should buy a heavy knit silk stocking to be worn while he is on his feet. Such stockings are rather expensive, they do not wear very long, and many patients will object to them for that reason. They also have another disadvantage, they will stretch if worn for any great length of time, and become misshapen to such a degree that they do not properly fit the patient's leg. If a patient is advised to wear a silk stocking you must superintend the fitting yourself, and have him report to your office frequently afterward that you may see that the stocking fits as you wish. In many instances the patient will buy a stocking which fits when it is new, but after being worn a few days it will become loose over that portion of the leg where it should fit tightly. Usually the stocking is too tight above the knee, and the result is an obstruction to the venous return blood supply which will aggravate instead of improving the varicosity. In other words, the stocking will be too loose between the ankle and the knee, and too tight

above the knee; it must fit like a glove from the knee to the ankle and be loosest above the knee to produce the best results. So much for the palliative treatment of varicose veins of the leg.

Next comes the radical methods of treatment: Where you have a condition which is constantly more or less troublesome, where the veins are very large, complications are almost certain to arise after the patient wears a bandage for a long time, and he will get to the point where relief will not follow any of the palliative measures. Finally he will come to you and demand that something be done to insure him permanent relief. Many patients will apply to you for treatment of the complications that may arise, and particularly if they are men they will say that they are unable to stand on their feet for any length of time without suffering considerable discomfort.

The radical treatment of varicose veins, of course, consists in the destruction of the blood supply to the dilated vessels; we must destroy the veins which are enlarged. There are several ways of accomplishing this result. One of the simplest methods, when the veins are enlarged only between the knee and ankle, is to make several incisions, say three or four, down to the blood vessels, carefully dissecting them free from the surrounding tissues and tying off and removing sections from one to two inches in length of the larger veins together with their branches, and closing the incisions with an aseptic dressing. Or by the vein stripper of Mayo one may remove several inches of the vein after making a small incision. This instrument is really nothing more than a small ring curette that is threaded over the vein at the point of incision and pushed downward as far as desired under the skin. During this procedure the smaller veins are separated from the large one threaded through the instrument.

Another method of radical cure is the so-called Schede operation, or a modification thereof, which we will probably be able to demonstrate to you during the coming session. In this procedure a circular incision is made around the leg, turning up the skin and underlying tissue down to the blood vessels, and tying off the veins as far around the leg as they may be enlarged, the object being to cut off entirely the venous circulation in the outer part of the limb. The

operation is not especially difficult, and after collateral circulation has become established there usually results a complete cure.

The next operation is to ligate the long saphenous vein high up in the patient's thigh. In this procedure the main trunk of the vein is ligated. This operation is not immediately successful in all cases, and when the patient recovers from the operation he will still have the varicose veins. He may come back to you and say that the operation did him no good as he still has enlarged veins, that they are just as large as they were before the operation. But you can safely say to such a patient that the enlarged veins will eventually disappear, all he has to do is to have a little patience. In the majority of instances the ultimate outcome of this procedure will be complete disappearance of the varicosity, but it takes longer for a cure to become apparent than by the other methods suggested.

Since these operative procedures are so successful in relieving or curing the condition, one may ask why we do not oftener perform radical surgery for the cure of varicose veins. The chief reason is the danger which attends the operation, and there are some real dangers to the life of the patient. There are some dangers resulting from the accumulation of blood clots after ligation of the veins; you may have a suppurative thrombophlebitis; infection may take place in spite of every precaution; as a result there may occur an acute thrombophlebitis, suppurative in character, which may spread to other parts of the body and kill the patient.

One of the most interesting features is the treatment of the complications when they arise. What are we to do in these cases? Suppose the patient comes to us, as this man does, with a varicose ulcer and eczema as a result of the varicose veins, what is to be done? In most cases the patient is in such circumstances that he does not care to undergo an expensive line of treatment extending over a period of many months, and he does not wish to have performed any radical operative procedure, since he merely comes to us for relief of the complications and not the primary cause of the trouble. You will find that this man represents the major class, the majority of those who will apply to you for treatment. Many of them will not consent to have anything done in the way of an operation, they simply want treatment for the complications. This patient, for instance, did not know positively that he had varicose

veins until we informed him of the fact, although he realized the veins were a little larger than they normally should be. He said he did not care to have anything done except to have the ulcer and the eczema treated; that he was in good general health, and merely wanted local treatment.

The first thing which we have to consider is the treatment of the eczema. That is one of the simplest complications with which you will have to deal, but I will say to you that it requires a great deal of attention and care, constant watching and an immense amount of patience on the part of both you and the patient in order that a cure may be effected. As you know, the vitality of the limb in such cases is very low, and eczema under such circumstances is hard to cure. As a rule in acute eczema, if we may rely upon what the dermatologists tell us, oxide of zinc ointment incorporating a little salicylic acid, persistently used, will be all that is required to effect a cure. In chronic cases a similar line of treatment will be equally effective if we can keep the patient practically off his feet, support the circulation with a properly adjusted bandage, and administer tonics to improve his general condition. Of course the patient's emunctories should be stimulated, the bowels and kidneys kept actively open, etc., his circulation supported, and the persistent local application of zinc ointment attended to,—these measures will bring about a cure. One must, however, warn the patient, at the very start, that two or three applications, and two or three weeks treatment, will not suffice to cure the condition. Occasionally when the disease becomes very chronic an irritative or more stimulating application may be required, such as the oil of tar, in order to stimulate the healing process.

The worst complication with which we have to deal is varicose ulcer, such as is presented by the case before us. These are the patients we absolutely dislike to treat because results are so unsatisfactory and the condition is so hard to cure. When a patient presents himself, as this man does, who has been under observation four or five months, with a circular ulcer of the leg, with varicose veins, with an eczematous condition of the entire leg between the knee and ankle, an impairment of the blood supply and unfavorable surroundings at home, you have a condition which is extremely difficult to cure. When such a patient presents an ulcer like the one

we see here, an ulcer which sinks in entirely around at the base, you must release the edges of the ulcer before the healing process can possibly take place. The skin is hard and tightly bound down to the base of the ulcer, and epidermization cannot take place unless you relieve the edges of the ulcer, for the healing process has absolutely ceased. The easiest way to do this, if the patient will submit to the treatment, is to use local anæsthesia around the edges of the ulcer, then introduce the point of your knife under the edges of the ulcer and loosen the skin from the base all the way around. In this way one gets rid of the edge which is so tightly united to the base, and allows the healing process to take place. If the patient will not permit this treatment, the next best thing is frequent scarification, by which I mean that one should take a knife and "nick" the edges of the ulcer all the way around. This will destroy the edges of the ulcer and thus allow healing to commence. The accumulation of membrane on the floor of the ulcer itself must be gotten rid of in order to permit of healthy granulation. Even if there is an effort on the part of nature to close the ulcer over with skin, it will not take place while there is present a dirty infected base with a thick membrane over the granulations. You will find that you cannot wash away this membrane, nor will salves remove it, the various antiseptics have little effect; moreover, the chances are the patient would not apply these antiseptic washes even if benefit could be expected therefrom, as the base of the ulcer is tender and irritable, and it is necessary for you to do something which will cleanse the ulcer and which at the same time will meet with no objection on the part of the patient. The easiest and neatest way of doing this is by application of a poultice made of brewer's yeast. Treated in this way you will find that the ulcer will discharge its membrane within twenty-four to forty-eight hours time, and you will have a perfectly clean surface. If you have not access to the brewer's yeast, you can get rid of the membrane by the application of a small quantity of pepsin. The ordinary peptogenic milk powder on the market contains enough pepsin for the purpose, if nothing else is obtainable. Instruct the patient to keep the ulcer well dusted with this powder, and when he presents himself about two days later you will find the ulcer practically clean. If you want to get rid of the membrane faster than this, take powdered pepsin and dust over the surface

of the ulcer and it will be found clean at the end of twenty-four hours. After the membrane has once been removed, the ulcer must be kept clean by means of some of the well-known antiseptics. If there is any effort whatever on the part of nature, the ulcer, if kept clean in the manner described, will soon begin to heal. At the same time a support must be given to the circulation, a procedure which is best accomplished by the application of adhesive strips. If you do not wish to apply a bandage to the patient's limb, or if you feel that a bandage will not give sufficient support, apply strips of adhesive plaster about an inch in width, one overlapping the other, extending part of the way around the leg. Never let your adhesive strips go entirely around the leg, as this would only obstruct the circulation and aggravate rather than benefit the condition. Start your adhesive strips in an oblique direction running either from above downward or from below upward, allowing them to extend about three-quarters around the limb, each one overlapping the other shingle fashion. When you have entirely covered the ulcer with these adhesive strips, extending at least an inch above and below the denuded surface, then turn and go the opposite way with another set of adhesive strips, in order to secure firm support. Before applying the adhesive plaster, you can, if you wish, cover the ulcerated surface with boric acid; but it is questionable whether this is of any material benefit. The application of adhesive plaster in the manner proposed will get rid of any œdema that may be present, and if left intact for three to six days and then removed by greasing thoroughly, you will find that the ulcer is well on the road toward recovery. The persistent use of soothing applications will complete the cure.

I am not very much in favor of using dusting powders on varicose ulcers. Many of them act as foreign bodies in the wound and retard rather than hasten the healing process. If you have an irritable ulcer a few applications of orthoform will allay the pain. If the patient is pursuing the treatment at his home, which he usually prefers, some form of ointment had best be used, because it is easy of application and easy to remove. Dusting powders become dry and often cause considerable additional irritation of the wound. An antiseptic ointment containing a small amount of mercury or ichthyol will often bring about good results. If the oxide of zinc

ointment is preferred, the addition of a small quantity of either of the above, or the following formula, may be found beneficial:

Resorcin	5 parts
Ichthyol	10 parts
Ungt. hydrarg.....	40 parts
Lanolin	50 parts
M. ft. ungt. Sig.—Apply once daily.	

The patient should be instructed to keep water and soap away from the ulcer. An eczematous surface should never be washed with soap and water; when it is necessary to cleanse the surface do so with sweet oil, wiping with a soft towel or gauze followed by a fresh application of ointment. If the ointment becomes incrustated over the surface, it can be easily removed by means of a cloth soaked in sweet oil.

This man's limb looks very much better now than it did a short time ago when our treatment was commenced. The ulcer has almost entirely healed, and we have only the eczema to contend with. We will persist in the treatment we have outlined,—the application of oxide of zinc ointment, with bandage applied to his limb from the foot to above the knee,—and feel assured that in a few months a perfect cure will result. Of course if he sustains any injury to his limb another ulcer will probably form in spite of any preventive treatment that may be instituted. As you probably know, varicose ulcers are always small to start with, then coalesce, and may extend over a large surface. It will, therefore, be understood that this man should exercise great care not to injure his limb in any way, as such damage would most likely be followed by one or more additional ulcers.

Always bear in mind that it may take a long time to bring about a cure in cases of this kind. Varicose ulcer is distinctly curable, but much care and patience are required. Patients of this class usually drift around from one doctor to another, never remaining with any one of them long enough for the treatment which may be instituted to have any enduring effect.

Gynæcology

THE CLINICAL MANIFESTATIONS OF UTERINE CANCER

BY JOHN A. SAMPSON, M.D.

OF ALBANY, N. Y.

THERE are three facts concerning uterine cancer which should be known, not only by every physician but also by every woman. The first one is that, in its incipency, it is a local process, and therefore the patient may be cured if the uterus is removed at that time and inoculation of the field of operation is avoided. The second one is that the growth is often rapid and, in a few months' or even weeks' time, it may extend beyond the uterus so that operative interference may be impossible or is attended with a high primary mortality and a small percentage of cures. The third fact which is of the greatest importance to the patient is, that, in the majority of the cases, manifestations of the disease appear before the growth has extended beyond the uterus, *i.e.*, when the dangers of an operation are slight and the chances of a cure great.

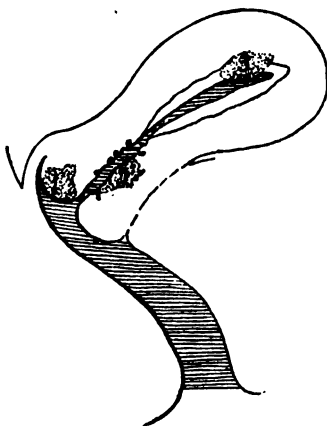
In order that we may the more successfully combat this dreaded disease every physician should clearly understand the clinical manifestations of uterine cancer, both in order that he may properly instruct his patients for whose welfare and knowledge of medical subjects he is directly responsible, and that he himself may be the means of detecting the disease before it has extended beyond operative relief.

The manifestations or symptoms of any pathological condition are but the manifestations of normal anatomy and normal physiology as altered by the conditions present; the symptoms which the patient perceives are known as subjective, and those which the physician detects as objective. If we are to understand those symptoms we must first study the pathological anatomy and pathological physiology from which they arise. The symptoms present in any indi-

vidual case of uterine cancer are determined by several factors such as its situation, the type of growth, its extent, whether or not necrosis has occurred, and if so the amount, and also if other pelvic disorders are present, such as a weakened pelvic floor, pregnancy, conditions resulting from pelvic infection, other new growths, etc.

It is the object of this communication to picture the various conditions found in these cases, to demonstrate the manifestations arising from them and thus to emphasize the significance of the various symptoms found in patients with uterine cancer.

FIG. 1.



Situations in which uterine cancer may arise ($\times \frac{1}{2}$).

We may classify uterine cancer topographically into cancer arising (1) from the vaginal portion of the cervix, (2) within the cervical canal and (3) within the body of the uterus.

Topographically, we may classify uterine cancer according to its origin, *i.e.*, whether in the cervix or body of the uterus, and we may group cervical cancer into that arising from the vaginal portion of the cervix or from within the cervical canal. (See Fig. 1.) It is evident that the situation of the growth must often play an important part in its clinical manifestations.

Histologically cancer may be grouped into the squamous-cell type and the cylindrical-cell or adenocarcinoma. The squamous-cell variety is found most frequently arising from the vaginal portion of the cervix but it may arise in the cervical canal, and a few instances of squamous-cell carcinoma of the body of the uterus have been reported. Adenocarcinoma is most frequently found in the

body of the uterus but may occur in the cervical canal or even arise from the vaginal portion of the cervix.

Irrespective of the situation of the growth or its histological structure, we may classify cancer according to its *morphology*. We do not understand why, in one case, the growth seems to “*evert*” giving rise to a papillary or cauliflower-like tumor and in another case apparently the same type may “*invert*” forming a nodule or mass of cancerous tissue with but very little evidence of the disease on the surface. Intermediate forms and sometimes both processes may be present in the same specimen, and apparently in the progress of the disease the growth may sometimes pass from one morphological type into the other.

In some cases the cancer cells predominate and the stroma forms a very small part of the tumor. As a result the tumor may feel soft, hence the term *medullary*. This may early become necrotic and portions of it slough away. Less frequently the process invades the uterine tissue in a diffuse manner forming a growth in which the stroma predominates, the so-called “*scirrhous*” cancer, which may retain its form for a long period of time.

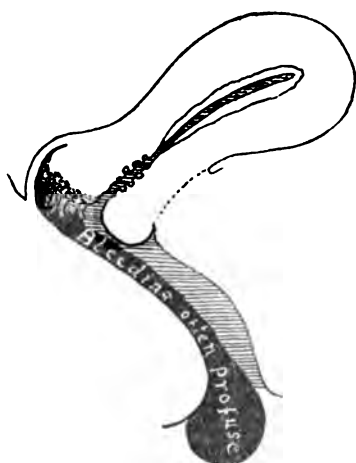
Specimens are encountered which cannot be included in the above classification and which may be looked upon as exceptions until we learn more about them. On further study we may discover either that they belong in one of the above groups, or that additional groups must be formed.

The everting or cauliflower type begins as a new growth of epithelial cells, associated with which there is a proliferation of the underlying connective tissue giving rise to a papillary outgrowth consisting of a central vascular core surrounded by epithelial (cancer) cells. As the surface of the tumor extends outward its base invades the tissues from which it arises. The growth is friable and easily injured and as the core is vascular, bleeding readily occurs. In addition the growth of the base of the tumor in time interferes with the blood supply of the surface with a resulting necrosis. It is evident that in this type of growth, irrespective of its origin, bleeding often occurs early in the course of the disease; and is not necessarily constant but is often profuse and brought on by exertion or anything which causes an injury to the tumor. The growth is easily detected, if it is situated where it can be palpated or seen, and, even

if it is in the body of the uterus, it is usually readily reached by the curette. Clinical records have shown that this is the more favorable type of uterine cancer.

The inverting, or nodular type, also begins as a new growth of epithelial cells but there seems to be very little reaction on the part of the underlying tissue and instead of a papillary outgrowth a cancerous nodule is formed in the tissue from which it arises, often with very little evidence of the disease on the surface. As the cancer

FIG. 2.



Everting cancer, vaginal portion of uterine cervix, early ($\times \frac{1}{2}$).

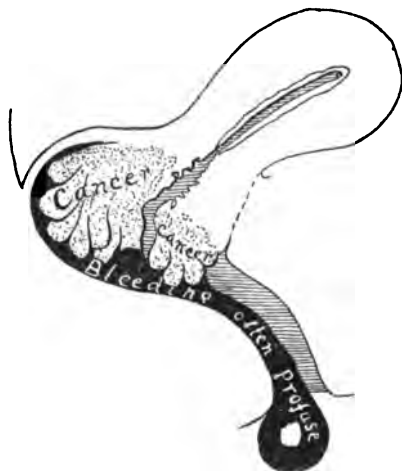
The subjective symptoms are limited to bleeding and a leucorrhœal discharge. Bleeding arises from necrosis of the papillary projections of cancer, or injury to them in straining, during sexual intercourse or using a douche; it occurs early, is often profuse but not necessarily constant. The growth can easily be palpated and seen.

A patient with a cancer similar to the one diagrammatically represented here was 37 years old, had a *bloody discharge* for *five months*, and a severe hemorrhage when straining at stool three weeks before the diagnosis was made. The chances for a cure were greater *five months* before, when the patient first noticed the bleeding.

increases in size the parts most remote from the blood supply, *i.e.*, the surface of the tumor, become necrotic, slough away, and an ulcer is formed, hence the term "ulcerative cancer." The ulcer may appear early or late in the course of the disease, depending on the blood supply of the growth, it may be superficial or deep, the base may be smooth or rough. On careful examination of the ulcers with a roughened base it can be seen that this roughness is caused by papillary projections which represent the tips of blood vessels sur-

rounded by cancer cells. This condition is analogous to the surface of the everting type and these papillary projections may in their growth simulate an atypical everting cancer. The inverting cancer irrespective of its size gives rise to very little or no bleeding while its surface remains intact; sometimes a watery discharge is present in the extensive growths. With a superficial ulceration or an ulcer with a smooth base, the bleeding is very slight and inconstant or may be entirely absent. On the other hand, the growth with a deep

FIG. 3.



Everting cancer (bulbous papillae), vaginal portion of uterine cervix, advanced, but local growth still confined to cervix ($\times \frac{1}{2}$).

The subjective symptoms are limited to bleeding and a leucorrhœal discharge. Bleeding has the same etiology as in the preceding illustration, while it may be profuse when it does occur, it is often inconstant because the bulbous papillae are not easily injured. Pieces of papillae may slough off and appear in the discharge. The growth can easily be palpated and seen.

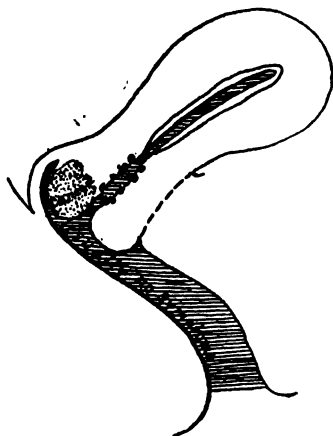
A patient with a cancer similar to the one diagrammatically represented here was unmarried, 41 years old, and had *uterine hemorrhages for ten years*. When the bleeding became profuse, she would have a curettage after which the bleeding would cease, to again reappear. The primary growth was local, but metastases had occurred. A hysterectomy should have been done *ten years before*.

or ragged ulcer is easily injured and the bleeding which occurs is often profuse; in addition there may be a foul watery discharge. It is evident that in the inverting type of uterine cancer, bleeding may occur late in the course of the disease. It is often slight and inconstant except in the late stages and as in the other type is often brought on by exertion. The growth is not always easy to detect even when situated in the vaginal portion of the cervix—its most

frequent situation. Clinical experience has shown that this is the more frequent type of uterine cancer, and unfortunately a very unfavorable one.

The Clinical Manifestations of Uterine Cancer while the Primary Growth is still Confined to the Uterus.—The everting type of growth arising from the vaginal portion of the cervix may be sessile, or pedunculated. The papillary projections may be fine as shown in Fig. 2, or coarse with bulbous ends, as shown in Fig. 3. In the everting type with fine projections (Fig. 2) the manifestations

FIG. 4.



Inverting cancer, vaginal portion of uterine cervix, early ($\times \frac{1}{2}$).

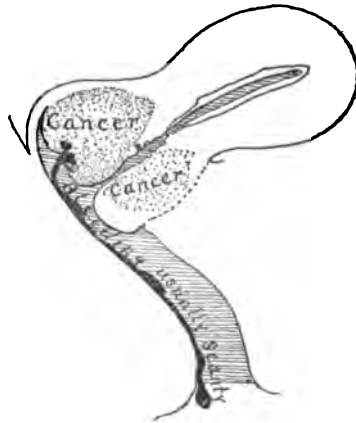
There are often not any subjective symptoms, occasionally a leucorrhœal discharge which may be watery and sometimes slightly blood tinged. Bleeding usually does not appear until after necrosis and ulceration have taken place. The cancer although friable is not easily injured while intact and its surface is smooth. The growth can be palpated, but the diagnosis is not always evident and it may be necessary to examine a piece of the growth microscopically.

noticed by the patient in the early stages are usually bleeding and sometimes a leucorrhœal discharge. The bleeding is not necessarily constant and varies in amount in individual cases; it is often brought on by straining at stool or any other exertion or following sexual intercourse or using a douche. The bleeding is sometimes bright in color and may amount to a severe hemorrhage. As the growth increases in size the bleeding becomes more profuse and more constant but it is still the only subjective symptom except perhaps a watery discharge and symptoms arising from a secondary anæmia (if the bleeding has been sufficient to cause it). The diag-

nosis is usually evident on inspection and palpation. If any doubt exists, a piece may be excised and examined microscopically.

In the everting type with coarse papillary projections the bleeding is not as constant as in the type just described because the cancer is more difficult to injure; when it does occur it may be very severe and portions of the growth may appear in the discharge as the result of necrosis either because the base of the tumor shuts off the

FIG. 5.



Inverting cancer, vaginal portion of uterine cervix, local growth extensive but may be confined to the cervix, slight ulceration ($\times \frac{1}{4}$).

Subjective symptoms are limited to bleeding and a leucorrhoeal discharge. The former is slight and inconstant and may be of very short duration (depending on the duration of the necrosis and ulceration which may occur late). The leucorrhoea is often watery and exists before the bleeding. The condition is usually evident on palpation and inspection.

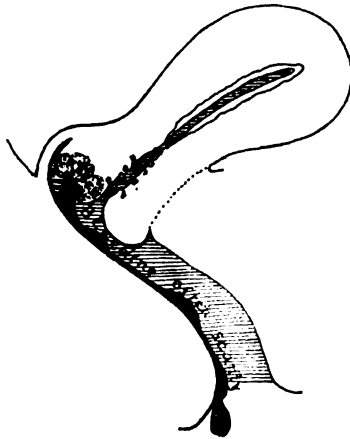
A patient with a cancer similar to the one diagrammatically represented here, was 86 years old and had been *bleeding* for only a few days. Another similar case was 62 years old and had been *bleeding* only seven weeks but had had a profuse *watery discharge* for four months. Metastases were present in the pelvic lymph-nodes of both patients. An earlier diagnosis could have been made in one of the cases.

blood supply of some distal portion of the growth, or the pedicle of one of these papillæ has become twisted. (See Fig. 3.)

As long as the *inverting* type of cancer of the vaginal portion of the cervix remains localized and necrosis does not occur, there are either no subjective symptoms, or if any are present, it is usually only a watery discharge occasionally blood tinged. In examining such a patient (see Fig. 4) a portion of the cervix will appear elevated and roughened, and slight bleeding will probably result from injury to the cancerous tissue. In many cases a correct diag-

nosis may be possible only from the microscopical examination of a piece of tissue removed. With necrosis and ulceration bleeding occurs; this depends in amount not upon the size of the growth but upon the depth of the ulcer and whether or not its base is rough and therefore easily injured. The growth may be extensive and the ulceration slight as represented in Fig. 5; in such a case the bleeding would be very slight and inconstant. A small growth with a

FIG. 6.



Inverting cancer, vaginal portion of uterine cervix. Early with slight but "ragged" ulceration ($\times \frac{1}{2}$).

The subjective symptoms are similar to those in Fig. 2, except that the bleeding is apt to be more inconstant and less profuse because the papillary projections of cancer are less numerous, lower and are better protected from injury. The growth can be easily palpated and seen.

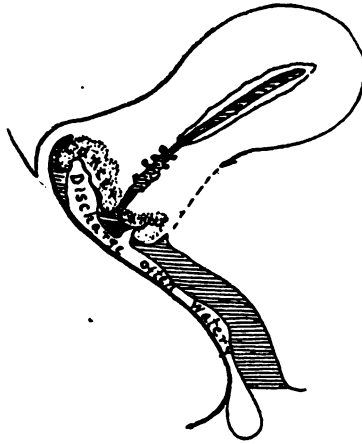
A patient with a cancer similar to the one diagrammatically represented here, was 58 years old and had had a more or less constant blood tinged discharge for *eight months* following a slight hemorrhage at the onset. In another similar case the patient was 54 years old and slight *bleeding* had been present for *two months*. Metastases were present in the second case but apparently not in the first one. An earlier diagnosis was possible in both instances and an earlier hysterectomy should have been done when the patient first noticed the bleeding *eight months* before in one case and *two months* before in the other.

superficial but ragged ulceration as shown in Fig. 6 might give rise to quite severe bleeding. On the other hand in an extensive ulceration with a smooth base bleeding might be absent or only occasionally present and then very slight. In the latter case a watery discharge would probably be present, often irritating and having a foul odor. (See Fig. 7.)

As this type of cancer increases in size it usually first invades the deeper tissues of the cervix and encircles the cervical canal; the

latter may not be actually involved until late in the course of the disease. (See Fig. 8.) As the ulceration becomes deeper, larger vessels are exposed and therefore the bleeding becomes greater; there is also apt to be a foul discharge from the necrotic tissue and pieces of the latter may even be present in the discharge. In a still later stage the central portions of the tumor surrounding the cervical canal may slough away and the cervix be converted into a shell, lined

FIG. 7.



Inverting cancer, vaginal portion of uterine cervix. Superficial but smooth ulceration ($\times \frac{3}{4}$). Bleeding may be absent or very slight and inconstant because the surface of the cancer is smooth and not easily injured. A watery discharge is apt to be present. The condition is easily palpated and seen. If any doubt exists as to the diagnosis a piece should be excised and examined microscopically.

A patient with a cancer similar to the one diagrammatically represented here, was unmarried, 32 years of age and *bleeding* occurred *two months* before I saw her and had been slight and very inconstant. The examining finger did not cause any bleeding. Metastases were present in the pelvic lymph-nodes. The diagnosis could have been made two months before.

with cancerous tissue. (See Fig. 9.) Often the bleeding in this stage is less in amount and frequency than during the preceding stage, and the patient may therefore think that she is getting better. If the tissue lining the cavity is smooth, there is apt to be less bleeding than when it is rough. Every strain on the part of the patient bends the uterus, including the cervix, and is apt to crack this thin shell of cancerous tissue and cause bleeding. There is also nearly always a very foul discharge associated with this stage of the disease.

In all cases but those with superficial ulceration the diagnosis is evident on inspection or palpation, but in the latter a microscopical examination of a portion of the tissue may be necessary.

Cancer starting within the cervical canal is usually of the inverting type. When the patient strains, the cervix is bent and this often "cracks" the cancerous tissue lining the canal and causes

FIG. 8.



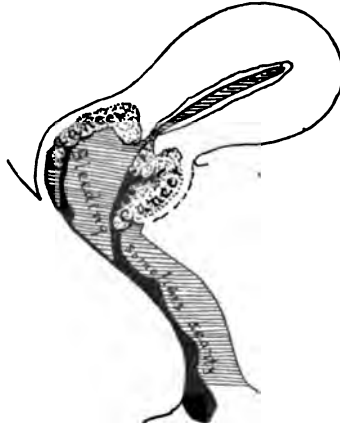
Inverting cancer, vaginal portion of uterine cervix. Necrosis and deep ulceration, late stage of the condition shown in Fig. 6 ($\times \frac{1}{2}$).

The duration of the bleeding depends upon the duration of the necrosis and at this stage, *i.e.*, with deep ulceration, it may at times be profuse and pieces of necrotic cancerous tissue may be present in the discharge. When bleeding is not present there is apt to be a profuse, foul leucorrhoeal discharge. The condition is evident on palpation or inspection.

A patient with a cancer similar to the one diagrammatically represented here was 50 years old and *bleeding* had been present for *three months*, first noticed when straining at stool, at times severe hemorrhages, no pain, but a more or less constant watery discharge. Growth was apparently local. The chances for a cure were greater *three months* before when the patient first noticed the bleeding.

bleeding. For this reason I believe that bleeding occurs earlier in cancer situated here than when the latter is in the vaginal portion of the cervix where it is imbedded in the tissues of the cervix and thus protected from any strain until after necrosis and ulceration occur. The only subjective symptoms of the early stage of this form of growth is occasionally slight uterine bleeding as the result of straining, and it is impossible to make a diagnosis without the microscopical examination of curettings from the cervical canal.

FIG. 9.

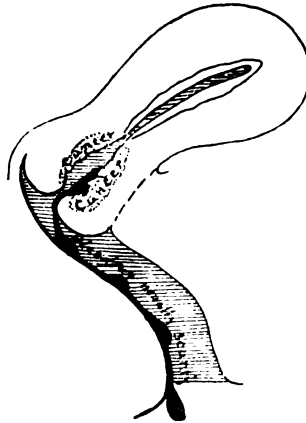


Inverting cancer, vaginal portion of uterine cervix. A later stage of the condition shown in the preceding illustration ($\times \frac{1}{2}$).

Bleeding may not be as constant or profuse as in the preceding stage, but there is often a very profuse, watery discharge. The diagnosis is usually evident on palpation and inspection.

A patient with a cancer similar to the one diagrammatically represented here was 40 years old and *bleeding* had been present for *eight months* and a foul discharge for a less period of time. Metastases were present in the pelvic lymph-nodes. The chances for a cure were greater *eight months* before when the patient first noticed the bleeding.

FIG. 10.



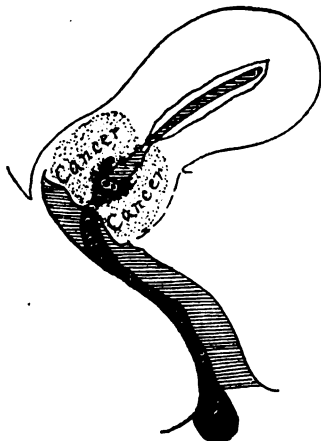
Inverting cancer, cervical canal. Early ($\times \frac{1}{2}$).

Bleeding is usually slight and inconstant following straining when the supravaginal portion of the cervix is bent and the cancer is "cracked." The diagnosis can only be made from the microscopic examination of *curettings* obtained from the cervical canal.

A patient with a cancer similar to the one represented here, was 46 years old and bleeding was only a few days in duration.

(See Fig. 10.) As the disease progresses the cervix becomes retracted and shrunken (see Fig. 11), and even though there is not any evidence of cancer on the surface, such a cervix should arouse one's suspicions. Still later in the course of the disease the cervical canal is converted into a shell lined by cancer and often with a fair preservation of the external os. (See Fig. 12.) The subjective symptoms of this stage are the same as the similar stage of cancer arising from the vaginal portion of the cervix; the bleeding may

FIG. 11.



A later stage of the condition shown in the preceding illustration ($\times \frac{1}{2}$).

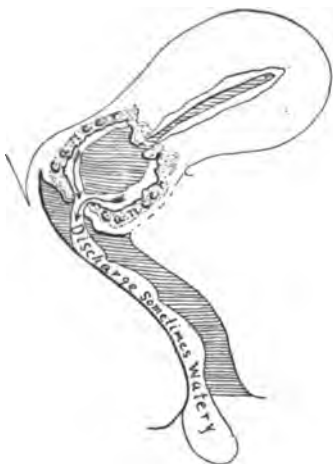
Bleeding is usually more constant and more profuse than in the preceding stage. The vaginal portion of the cervix is retracted and shrunken. This condition can be palpated and should arouse one's suspicions. A positive diagnosis may be possible only from the microscopical examination of curettings.

A patient with a cancer similar to the one diagrammatically represented here, was 54 years old and *bleeding*, the only symptom, had been more or less constantly present for *eight months*. Metastases to the pelvic lymph-nodes were present. The chances for a cure were greater *eight months* ago when the patient first noticed the bleeding.

be inconstant and only as a result of straining, and the symptoms are less alarming than in the previous stage. A foul watery discharge is nearly always present. In examining the patient, the retracted, shrunken vaginal portion of the cervix can be felt and often the tip of the forefinger can be passed through the external os and the cavity within palpated.

Cancer arising in the body of the uterus is usually of the evert-ing type and therefore often easily injured when the uterus is bent or compressed as in straining. If the patient still menstruates the

FIG. 12.

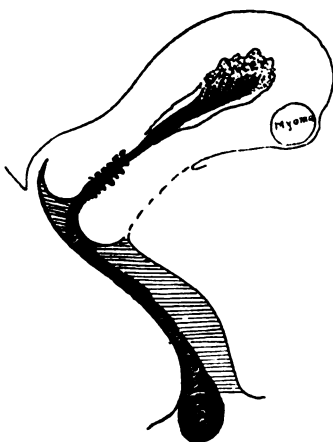


A later stage of the condition shown in the preceding illustration ($\times \frac{1}{2}$).

Bleeding is often less constant and less profuse than in the preceding stage. A foul, watery discharge is often present. The retracted, shrunken vaginal portion of the cervix can be palpated and also the cavity within.

A patient with a cancer similar to the one diagrammatically represented here was 48 years old and *bleeding* had been present for *eighteen months* and a foul discharge for less time. Metastases were found in the pelvic lymph-nodes. The chances for a cure were much greater a year and a half ago when the patient first noticed the bleeding.

FIG. 13.



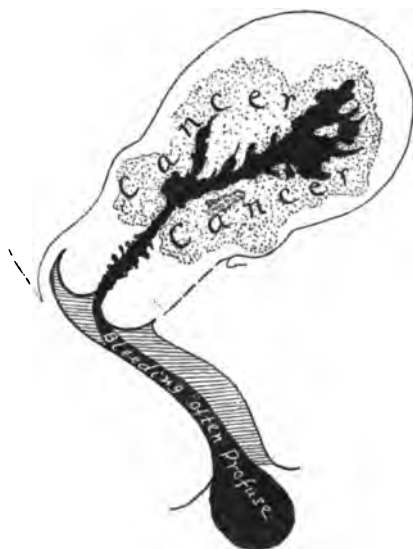
Early cancer of the body of the uterus ($\times \frac{1}{2}$).

Bleeding may appear as a menorrhagia in those who have not reached the menopause or simulate a return of the menses in those past the menopause. A diagnosis is only possible by the microscopical examination of the cancerous tissue.

A patient with cancer similar to the one diagrammatically represented here was 44 years of age, and the only symptom referable to cancer was that menstruation had gradually become more profuse and prolonged during the *last year*. Prognosis is usually favorable.

flow is prolonged and more profuse. A watery discharge is also often present. In the early stages the uterus appears normal on palpation and a diagnosis can only be made from the microscopical examination of curettings. (See Fig. 13.) As the disease progresses the uterus often becomes larger and irregular in outline, the latter being

FIG. 14.



Later stage of cancer of body of uterus ($\times \frac{1}{2}$).

Bleeding is often more or less continuous but may cease for a few days or weeks to again reappear. There is very apt to be a watery discharge, often blood tinged.

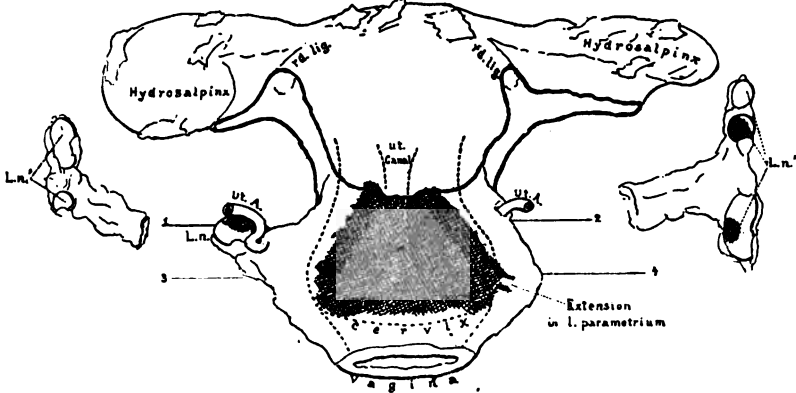
On examination the body of the uterus feels large and often irregular in outline and consistency, sometimes simulating a myomatous uterus. A positive diagnosis can only be made by means of the microscopical examination of cancerous tissue.

A patient with a cancer similar to the one diagrammatically represented here was 56 years old, had been *bleeding for three years*, at first inconstant and profuse but recently more constant and less profuse, watery and with a foul odor. Metastases were present in the abdominal and pelvic lymph-nodes. The chances for a cure would have been good *three years ago* when the patient first noticed the bleeding.

due to the invasion of its walls by the cancer. The bleeding becomes more profuse and more frequent. On bimanual examination the uterus may feel larger, softer, irregular in consistency and outline (see Fig. 14) and one may suspect small myomata in its walls. Myomata and cancer of the body often occur in the same uterus. A positive diagnosis can be made only from the microscopical examination of curettings.

It can be seen that the *subjective clinical manifestations of uterine cancer while the primary growth is still confined to the uterus are limited to bleeding, a leucorrhœal discharge and such symptoms as may arise from the loss of blood and possible absorption of toxins from the cancer.* In cervical cancer the bleeding does not resemble and is not influenced by the menstrual flow except in so far as they may occur together and the uterus is more

FIG. 15.



Reconstruction of cancer in specimen removed at operation. Direct extension into left parametrium with metastases to pelvic lymph-node of left side and to one of right parametrium ($\times \frac{1}{2}$).

Patient was 36 years old. Bleeding had been present for only a few days. Pain in the lower abdomen was of seven weeks' duration and probably due to adhesions associated with the bilateral hydrosalpinx.

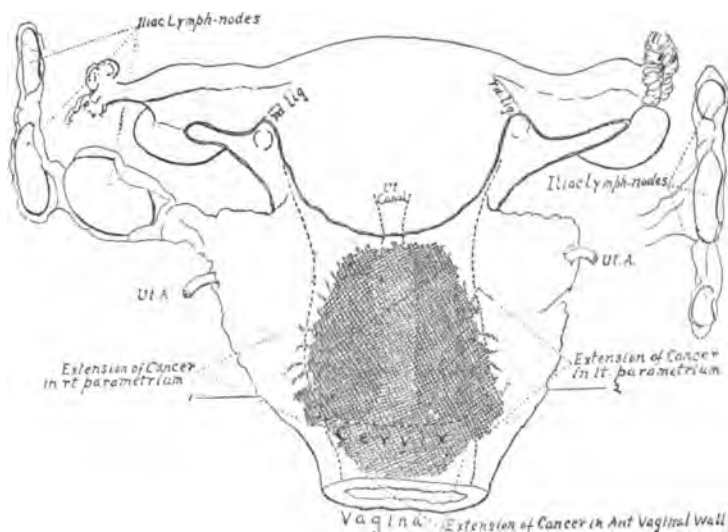
The mobility of the uterus was restricted by the pelvic adhesion, the left parametrium felt slightly indurated, but not the right. The lymph-nodes could not be palpated. Type of growth was squamous-cell cancer, vaginal portion of cervix, inverting. Sometimes there are not any subjective manifestations of uterine cancer while it can still be cured, but this is the exception and not the rule.

vascular at that time. On the other hand with cancer of the body of the uterus occurring in women before the menopause, menstruation is apt to be prolonged and made more profuse and this may be the first manifestation of the disease. I wish to emphasize that in the inverting type of cervical cancer bleeding does not occur until after necrosis takes place and is at first slight and inconstant, and furthermore that necrosis sometimes does not occur until after the growth has extended beyond the uterus.

The Clinical Manifestations of the Invasion of the Parametrium by Cancer of the Uterine Cervix.—In twenty-seven specimens of

cervical cancer, removed at operation, I was able to demonstrate that the parametrium was involved in seventeen instances; eight times by direct extension alone, either en masse or in the form of thread-like processes (frequently along the lymph channels or in the nerve sheaths); three times by metastases in the lymph structures of the parametrium without any evidence of a direct extension of the disease beyond the cervix; and in six cases both forms of

FIG. 16.



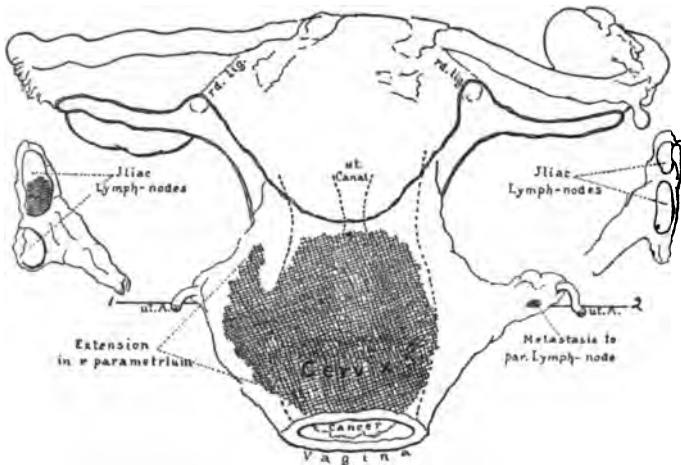
Reconstruction of cancer in specimen removed at operation. Large primary growth with direct extension into the parametrium, but pelvic lymph-nodes were apparently free ($\times \frac{1}{2}$).

Patient was 37 years old. *Bleeding* was the *only* symptom, of *two years' duration*, at first irregular but very profuse, constant the last three months. The mobility of the uterus was restricted by the extension of the cancer into the parametrium and the indurated parametrium could be distinctly palpated. Type of growth was squamous-cell cancer, cervical canal, inverting. The chances for cure were much greater *two years ago* when the patient first noticed the *bleeding*.

invasion were present. In nine instances of metastases in the parametrium, the parametrial lymph-nodes were involved in all but one case; in only one instance was the metastasis apparently in a lymph channel and here faulty technique makes this observation untrustworthy. Of great interest is the possibility of the new formation of minute lymph-nodes which project into the lymph channels like sponges and to which cancer may metastasize.

It is unusual for the invasion of the parametrium, such as occurred in these seventeen instances, to cause any subjective symptoms and if pain is present it is usually due to some associated condition as adhesions from a previous pelvic inflammatory disease. (See Figs. 15, 16, 17 and 18.) When a cancer of the uterus causes pain it usually indicates that the disease has extended beyond the uterus and has involved sensitive nerves along the sides of the pelvis, and the prognosis is nearly always unfavorable. The pres-

Fig. 17.



Reconstruction of cancer in specimen removed at operation. Direct extension into right parametrium, with metastases to the pelvic lymph-nodes of both sides and to one of the left parametrium ($\times \frac{1}{2}$).

Patient was 35 years old. Bleeding had occurred every time she had sexual intercourse or used a douche during the last six months. Pain had been present for several years, probably due to pelvic adhesions from previous inflammatory trouble.

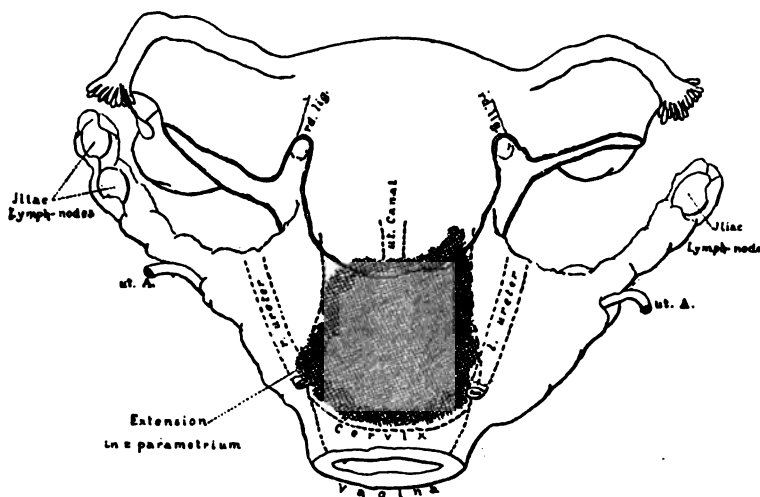
The mobility of the uterus was restricted by pelvic adhesions and the involvement of the right parametrium by cancer which could be distinctly palpated. The lymph-nodes could not be palpated. Type of growth as in preceding illustration. The chances for a cure were much greater *six months* before when she first noticed the bleeding.

ence of a direct extension of cancer into the parametrium is usually accompanied by a reaction on the part of the surrounding tissue which varies greatly in different cases but can usually be detected by the examining finger, especially through the rectum. On the other hand a hard or soft feeling parametrium affords no definite evidence of the presence or absence of cancer in that tissue or, if present, its extent. A parametrium may feel normal and yet contain cancer, occasionally as thread-like extensions from the primary

growth but more often as metastases. It is remarkable how little the metastases in the lymph-nodes of the parametrium alter those nodes or affect the surrounding tissues so that they may be clinically detected. Only by the microscope can we exclude cancer from this situation.

In extensive involvement of the parametrium pain is usually, but not always, present; when it is present, it arises from the

FIG. 18.



Reconstruction of cancer in specimen removed at operation. Direct extension into parametrium of both sides, but pelvic lymph-nodes were apparently free ($\times \frac{1}{2}$).

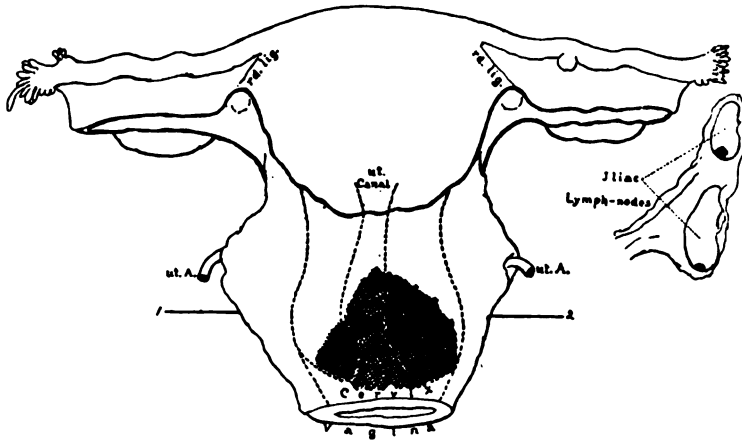
Patient was 44 years old. *Bleeding* had been present for *seven months*. Pain in lower abdomen of both sides was present and probably was due to the extension of cancer.

One can see that the ureters would soon have been compressed by the growth. The mobility of the uterus was restricted by the extension of the cancer into the parametrium of both sides and the indurated condition caused by this extension could be distinctly palpated. Type of growth was same as in the preceding illustration. The chances for a cure were much greater *seven months* before when the patient first noticed the bleeding.

involvement of sensitive nerves. The ureters often become compressed with a resulting renal insufficiency (probably the most common cause of death) but even in these cases pain is not always present.

The Clinical Manifestation of Metastases to the Pelvic and Abdominal Lymphatics.—Cancer of the body of the uterus rarely gives rise to metastases and then only in its late stages and usually to the abdominal lymph-nodes. On the other hand metastases to

FIG. 19.



Reconstruction of cancer in specimen removed at operation, early primary growth, parametrium of both sides free, but metastases to the pelvic lymph-nodes of the left side were present ($\times \frac{1}{2}$).

Patient was 54 years old. *Bleeding*, the only symptom, had been present for two months.

Aside from the local growth in the cervix, the pelvic organs felt normal. Type of growth was squamous-cell cancer, vaginal portion of cervix, inverting.

The chances for a cure were greater two months before when the patient first noticed the bleeding.

FIG. 20.



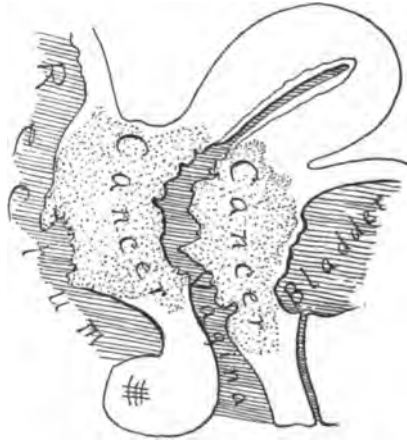
Anterior extension of cancer of the uterine cervix, involving the posterior vesical wall ($\times \frac{1}{2}$).

A patient with such a condition would probably suffer from bleeding which would not necessarily be constant or profuse; a watery often foul, discharge; pain (not always present, depending on the lateral extension of the growth) and frequency of urination, the latter being due to the involvement of the bladder.

On bimanual examination the involvement of the bladder can be distinctly palpated, but its extent cannot be accurately estimated. On cystoscopic examination the bladder mucosa over the growth is often cedematous and thrown into folds.

the pelvic lymph-nodes are found in at least one-third of the operable cases of cancer of the uterine cervix. In nineteen cases in which the pelvic lymph-nodes, removed at operation, were studied by me, cancer was found in nine. The percentage may have been higher in these cases for the nodes removed at operation were only the accessible ones along the iliac vessels and sides of the pelvis. Accordingly, it is not only possible but probable that other nodes than those removed may have contained cancer. While the lower abdominal lymph-nodes may be involved in the so-called cases of

FIG. 21.



Extensive cancer of the uterine cervix which has involved the bladder, vagina and rectum ($\times \frac{1}{4}$).

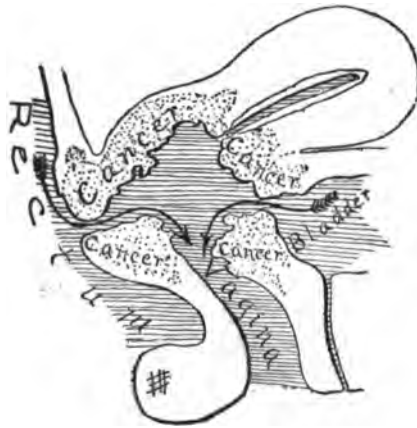
A patient with such a condition is usually cachectic, suffers from pain (not necessarily present or constant in every instance), frequency of urination, constipation, pain and bleeding on defecation, uterine bleeding and often a foul discharge. She may also have symptoms of uræmia due to the compression of the ureters by the lateral extension of the cancer. The condition present is readily detected on bimanual examination.

“operable cancer of the uterine cervix” (I have found them involved in two instances) the pelvic lymph-nodes are usually the first and often the only ones involved in this stage of disease. Subjective symptoms apparently do not arise from these cancerous nodes unless the growth extends further and compresses sensitive nerves or the ureter. I operated on an apparently early growth in a patient, who had severe pain in the left lower abdomen radiating down her thigh, and found a freely movable uterus with extensive involvement of the left side of the pelvis due to extension from

metastases to the pelvic lymph-nodes. This extension of cancer from the lymph-nodes apparently involved the obturator and sciatic nerves, and had also compressed the lower end of the ureter causing a marked hydro-ureter. Usually such an extensive involvement from metastases is associated only with an advanced primary growth.

It is impossible to detect cancerous lymph-nodes by bimanual palpation unless they are very large. The prognosis for a cure is so unfavorable after metastases have occurred that it is still an

FIG. 22.



Extensive cancer of the uterine cervix, with the formation of rectovaginal and vesico-vaginal fistulae ($\times \frac{1}{2}$).

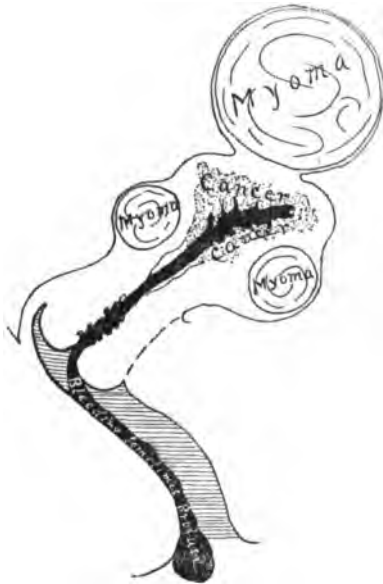
A patient with such a condition suffers from incontinence of urine and feces due to their escape through the vagina and the other symptoms present in the case represented in the preceding illustration.

undecided question whether or not it is justifiable to attempt to remove the pelvic lymph-nodes, because it increases the primary mortality and all the nodes which may be involved cannot be removed.

The Clinical Manifestation of the Advanced Cases of Uterine Cancer.—The bladder is early involved by the anterior extension of cervical cancer; vesical irritability then appears and later the necrosis may be so extensive that a vesicovaginal fistula results. Likewise by the posterior extension of the disease the rectum becomes involved and later a rectovaginal fistula may appear. The vagina may become filled with the growth or in another case may

be converted into a cloaca into which both the rectum and bladder empty. As has been stated the ureters are compressed in the lateral extension of the disease giving rise at first to a polyuria, then an oliguria and finally death from renal insufficiency. Fortunate is the patient when uræmia benumbs her sensibility to pain and the other discomforts of her condition.

FIG. 23.



Cancer of the body of the uterus, associated with uterine myoma ($\times \frac{1}{2}$).

The only subjective symptom would be uterine bleeding appearing as a menorrhagia, a metrorrhagia, or both. On examination the multinodular myomatous uterus would readily be detected and one might easily suppose that the bleeding came from a submucous myoma.

We should always exclude cancer (by curettage and the microscopical examination of the curettings) in every patient with a myomatous uterus with uterine bleeding no matter how slight before deferring a hysterectomy or advising that it should not be done.

The Clinical Manifestations of Uterine Cancer Associated with Other Pelvic Conditions.—It must always be borne in mind that uterine cancer is often associated with other pelvic conditions. A patient who has a cervical cancer in a retroflexed uterus, weakened pelvic floor with cystocele and rectocele, is apt to suffer from back-ache, sense of a loss of support, frequency of urination, constipation and uterine bleeding. Of all these symptoms bleeding may be the only one caused by the cancer. (See Fig. 24.) The pain from which a patient suffers may not arise from the cancer but from

pelvic adhesions, the result of a previous tubal inflammation. These same adhesions may interfere with the mobility of the uterus and thus mislead one as to the extent of the growth. The patient may have in addition an ovarian cyst or uterine myomata. Because a woman has a myomatous uterus does not necessarily indicate that the bleeding arises from a submucous myoma, but it may come from a cancer of the cervix or body of the uterus. *The operative treatment of a myomatous uterus with uterine bleeding should never be*

FIG. 24.



Localized cancer of the uterine cervix in a patient with an adherent retroflexed uterus and weakened pelvic floor ($\times \frac{1}{2}$).

The patient complains of pain, backache, frequency of urination, a sense of loss of support and bleeding, but *bleeding* is the *only* symptom due to the cancer. All others are due to the other conditions present. On examination one is able to detect the conditions represented.

If a patient with uterine cancer has pain and the mobility of the uterus is limited, both of these manifestations may be due to some other conditions than cancer and this must always be borne in mind when deciding whether or not an operation is indicated.

deferred until cancer has been excluded. A patient with cancer of the cervix may become pregnant; the growth may interfere with labor, or predispose to infection, and pregnancy in turn seems to favor the extension of the growth.

In every case of uterine bleeding cancer must always be considered irrespective of the apparent condition present.

Other Clinical Features of Uterine Cancer.—Cancer appears as a primary growth more often in the uterus than in any other

organ of the body, and the cervix of the uterus is much more frequently involved than the body.

Cancer of the uterine cervix usually grows rapidly and soon invades, by direct extension or by metastases, the neighboring structures so that patients rarely live over three years; about three-quarters of them die within two years and one-third within one year after the first manifestation of the disease. Unfortunately, it is a disease of mid-life and not of old age, occurring most frequently between the ages of thirty and fifty years. When in addition to this we consider that nearly all those afflicted with this disease have born children, and that it apparently runs a more rapid course in young women and that pregnancy seems to increase the rapidity of the growth, we must realize that patients afflicted with cancer of the uterine cervix are usually those who are most important for the welfare of the home.

The treatment of cancer of the uterine cervix has been most unsatisfactory. In August, 1904, I analyzed the records of all the cases of cancer of the uterine cervix which had been admitted to the gynecological department (Dr. Kelly's Clinic) of the Johns Hopkins Hospital during the fifteen years of its existence. Of the 412 cases, 250 or 61 per cent. came too late for anything but palliative treatment. At that time there had been 84 cases in which five years or longer had elapsed since operation, eight had died as the result of the operation and ten had been lost track of. Of the remaining 66 patients, 16, i.e., 24 per cent., were living and apparently free from cancer (Sampson, *Journal Am. Med. Assoc.*, 1905, xliv, 1586-1593).

Wertheim's results (*Surg., Gyn. and Obst.*, 1907, vol. ix, p. 9) are most encouraging. He now operates on 50 per cent. of all cases coming under his observation, and 60 per cent. of those in which five years or more have elapsed since operation are free from recurrence.

My own experience has taught me that in the clearly "operable" cases the primary mortality is low, and I am hoping for a high percentage of cures, although the disease has reappeared in a few of my apparently favorable cases. My results in the operative treatment of the doubtful cases with more or less fixed uteri, due to involvement of the adjacent structures, have been discouraging.

The operative mortality has been high and the growth has reappeared in the majority of those who have survived the operation, still in a few instances the patients have been at least temporarily relieved and life has been prolonged and possibly saved. The palliative operative treatment of the distinctly "inoperable" cases has been very unsatisfactory in my hands.

In regard to the operative treatment, a wide excision of the parametrium is demanded; first, because it is so frequently involved, and secondly, because even the extensive "operable" growths are local in at least half of the cases. We must also bear in mind that only by the microscope can we definitely determine the existence of cancer in the parametrium, or its extent. The pelvic lymph-nodes are involved in probably at least one-third of all the "operable" cases, but it is impossible to remove all the pelvic lymph-nodes at operation and the procedure increases the primary mortality. Whether the increased percentage of cures caused by their removal will more than offset the increased primary operative mortality due to their removal is a problem which has not been solved. That operation which will give the widest excision of the growth with the lowest primary mortality is indicated, and I prefer the abdominal route. It is certain that the *usual abdominal hysterectomy* does not remove any more of the parametrium than the *usual vaginal hysterectomy* and is attended with a higher primary mortality. One hopeful sign however is present and that is that there is history of neglected uterine bleeding for six months or more in over half of our cases. Put back the growth where it was six or even two months before the diagnosis was made or the patient consented to an operation, and more of the cases would be operable and the operation would be attended with a lower mortality and a higher percentage of cures.

Cancer arising in the body of the uterus is much less frequent, grows more slowly and remains restricted to the uterus for a much longer time. For these reasons the diagnosis is made earlier in the course of the disease and its operative treatment has been attended with a low primary mortality and a high percentage of cures. The average age of those afflicted is greater than in the other type and it occurs as often in those who have not had children as in those who have. Hysterectomy whether by the abdominal or vaginal

route usually removes the entire disease in all but the advanced cases.

The classical subjective symptoms of uterine cancer, *i.e.*, bleeding, a foul discharge, pain and cachexia, bear the same relation to uterine cancer as do abdominal distention, fecal vomiting, a high temperature, pinched expression and rapid pulse bear to appendicitis. It is true that the former are often the symptoms of uterine cancer but they are also those of approaching death, and unfortunately, only too often not only a prolonged one but also an unnecessary one. *We should realize that the classical symptom of uterine cancer while there may be a chance for a cure, is uterine bleeding, whether slight or profuse, constant or inconstant, and that every case of uterine bleeding must be considered as a possible one of uterine cancer until proved otherwise.* What we need is the prophylaxis of the incurable stage of uterine cancer and that is possible in the majority of the cases but only by the education of the physician and through him the patient, and it is to the physician that this contribution is offered. All that is necessary is the determination on our part to make a diagnosis in every case of uterine bleeding. In order to further this cause, we should obtain the coöperation of our patients which can only be accomplished by their proper instruction as to the importance of an early diagnosis when uterine bleeding is present, and especially when slight, inconstant, and painless, the one type they are so apt to neglect and the very type which beginning cancer causes, and often the most malignant variety.

GONORRHŒA AND PREGNANCY

BY ERNEST BOYEN YOUNG, M.D.

of Boston

First Assistant Visiting Physician for Diseases of Women, Boston City Hospital; Assistant in Gynæcology, Harvard Medical School

ALTHOUGH gonorrhœa is probably as ancient as Old Testament times, it is only within comparatively recent years that its important bearing upon pregnancy and genito-urinary diseases in women has been generally recognized.

Noeggerath, no matter how absurd his statistics may have seemed, deserves the gratitude of the medical profession for bringing into prominence the relation of this disease to female pelvic disorders. To-day, in the light of more careful and improved methods of examination, his figures do not appear so exaggerated, and if we are entitled to rely on hospital statistics for the lower classes, it is not certain that his estimate is so far from the truth.

While gonorrhœa exacts a large toll in mortality and health from both male and female, on the latter it inflicts a far greater burden of suffering, with the possibility of chronic invalidism or death, and the probability of the loss of all chance of child-bearing. In round numbers, 80 per cent. of all deaths from inflammatory diseases peculiar to women; 50 per cent. of all pelvic operations; and fully $\frac{2}{3}$ to $\frac{3}{4}$ of all inflammations of the uterus and Fallopian tubes are due to infection with the organism of Neisser.

On the Gynæcological Service of the Boston City Hospital for the past year, over $\frac{1}{5}$ of the cases admitted had troubles traceable to gonorrhœa, and about $\frac{1}{2}$ of all the abdominal operations were for salpingitis.

In Germany, among 100 pregnant women, Oppenheimer found 27 per cent. infected, Schwarz 12.4 per cent., Lomer 27 per cent. Zweifel and Sänger consider 18 per cent. as infected, while Fitch states that 90 out of 100 women, whose husbands have contracted gonorrhœa before marriage, suffer some ailment. Vörner says that fully $\frac{1}{2}$ the patients he sees have signs of previous gonorrhœa, and

among certain classes fully $\frac{4}{5}$ acknowledge themselves sufferers from the same.

Doktor, writing in 1895, stated that in England over 80 per cent. of the middle classes were said to have gonorrhœa at some time.

When, in addition to these facts, we stop to consider that about 50 per cent. of all sterility is due to this cause (either in male or female); aside from the physical suffering which it is the special province of the physician to prevent and alleviate, the economic question is of great importance to the community, both as regards the decrease of births, and the support of persons incapacitated for ordinary vocations by the ravages of this disease.

Gonorrhœa in its relation to pregnancy may be considered under three heads:

- (1) Influence upon conception;
- (2) Influence upon the course of pregnancy;
- (3) Influence upon the puerperium.

As gonorrhœa often produces sterility in the male, in attempting to draw conclusions regarding its frequency as a cause of sterility in the female, it is always necessary to remember the possibility that we are dealing with sterility in the opposite sex. If, however, the statement of Fitch be true, which has already been mentioned above, it would seem that the delicate structures of the female must suffer even more severely than those of the male, and hence the disabilities on their part be much more frequent.

Vulvovaginitis in early childhood may be followed by acute peritoneal symptoms, and to this have been ascribed atrophic conditions and deformities of the uterus in later years: hæmatocolpos, scanty menstruation, and early menopause. Fortunately, the undeveloped state of the female sexual organs at this time seems to be somewhat of a protection, and extension to the peritoneum in childhood is not common. The writer has seen one such case. Hunner and Harris report two fatal cases.

Vaginitis in small children is said to occur in about 1 per cent. of cases admitted to hospitals and those with purulent discharge are almost certainly of gonorrhœal origin.

After puberty, if the disease can be kept from the vagina and cervix, it will naturally influence but slightly the chances of future

child-bearing. Unfortunately there are but few women who come under the physician's care until the organisms have spread beyond the vestibule; and in many, the cervix is involved from the start, either with or without visible infection of the structures about the entrance to the vagina. If of mild virulence, gonococci may remain in the cervix or urethra, offering no macroscopic sign, and showing no tendency to spread to other parts. Lepmann, Martin, and others, consider that the infection usually stops here.

The view has been advanced, that the organisms die out after a time or are overcome by the tissues. Spontaneous healing, however, is denied by Asch, although Gottschalk holds it to be possible in certain cases. Conception may take place when the organisms are present in the cervical canal, as was demonstrated in two young women recently delivered in our wards. Both contracted the disease before becoming pregnant; gonococci were demonstrated in the cervical discharge of each; and one had suffered some months from gonorrhœal rheumatism.

Martin believes that impregnation takes place in chronic gonorrhœa, especially when localized in the cervix, and this seems abundantly verified by many reported cases.

If the inflammation of the cervix is more severe, and the cervical secretion altered in consistency, the probability of impregnation is much less. In fact, I believe the hindrance lies in the changed character of the secretion and not in the presence or absence of the Neisser organism, although it cannot be denied that toxic substances may be produced, even if experimental proof on either side is as yet unconvincing. Acute gonorrhœa contracted at the time of intercourse does not always prevent conception, as one of our patients was apparently impregnated and inoculated with syphilis and gonorrhœa by a single coitus.

Involvement of the body of the uterus and Fallopian tubes is more serious in its consequences, but, according to one writer, the outlook is not hopeless, as one of his cases became pregnant after a gonorrhœal salpingitis. Bumm holds this same view. A young woman also appeared at our clinic, 3 months pregnant, with a large double pyosalpinx. This would seem to point to an infection of uterus and tubes previous to or at the time of impregnation. It is also possible that the condition of the generative organs in early

pregnancy, as at the catamenial period, may offer a favorable opportunity for extension of the disease; since it is quite common for an apparently latent gonorrhœa to spread to the appendages at the time of menstruation. There is also the bare possibility that the infection reaches the tube through the lymphatics, instead of by direct continuity of mucous membrane, as Wertheim has found the cocci in the blood and lymph vessels of the bladder, and also Krönig in the pelvic tissues.

Krönig and Bumm both consider it possible for an ovum to become implanted and develop in an infected uterus; while Wertheim holds that it must be free from organisms before pregnancy can occur.

Hunner, in a recent article, says that gonorrhœal endometritis is infrequent, and shows decided tendency to repair, but this statement is hardly borne out by the findings of Bumm, who, among 100 women, reported the body of the uterus involved in 54, and the Fallopian tubes in 43. Findley states that the uterus is a favorite site for gonorrhœa, and is found involved in both acute and chronic stages: the infection remaining confined to this organ for months, whence it may suddenly spread to adjacent parts.

Diffuse peritonitis, although rarely demonstrated bacteriologically, may arise from the gonococcus, and pelvic peritonitis is unfortunately too common clinically after puberty. Both these may influence normal conditions by producing malformations and mechanical hindrances, to the influence of which ectopic gestation has been ascribed.

Döderlein and Krönig in their work on *Operative Gynæcology* (2nd Edition), speak of 38 cases of salpingitis followed to from three to four years after onset, without the occurrence of pregnancy, although pregnancy has been reported after double pyosalpinx. Unfortunately, the exact condition of such apparently favorable cases is seldom fully reported, and little detail is given as to the gravity of the original process. We may, however, safely say from the literature upon this subject, that the greater proportion of women never become pregnant, when once the Fallopian tubes are the seat of a gonorrhœal infection.

Pregnancy once established, various mechanical difficulties may attend its progress. Adherent displacements may prevent the ascent

and enlargement of the uterus, ending in miscarriage; although in some instances the uterus in its slow growth stretches the adhesions and rises from the pelvis.

Gonorrhœal endometritis, according to Wertheim, Maslowsky, and Fehling, may lead to early separation of the placenta and abortion, by causing infiltration of the outer layers of the decidua; although Lepmann states that the cocci die when the layers of the decidua join. Martin, after a careful examination of many abortions, was unable to demonstrate the gonococcus with certainty, but Neumann found gonococci in the decidua of 2 cases a few days after childbirth.

Lobenstein and Harrar consider gonorrhœa contracted in late pregnancy a frequent cause of premature birth.

Pregnancy may progress to full term even with an abscess of the Fallopian tube, and I have been unable to see that gonorrhœa contracted during pregnancy has shortened its duration.

A previous gonococcal invasion has been looked upon as responsible for adherent placenta; but in several instances, where the placenta has been examined, there has been nothing upon which to base such an assertion.

Audebert thinks gonorrhœa of the uterus a cause of premature labor, and Lobenstein and Harrar feel that such is the case when contracted in the later months of pregnancy.

It is plain from the foregoing that there is no unanimity of opinion as to the influence of gonorrhœa upon the course of pregnancy; but reasoning from the behavior of infectious processes in general, and the effect of this special organism upon the genital tract at other times, there would seem to be no valid reason to doubt that it may induce tissue changes or produce toxins inimical to the well-being of the mother; and which cannot fail to exert some effect upon the growth of the ovum. The children of mothers who suffer with gonorrhœa during the pregnancy are said to be less healthy after birth and more liable to succumb to mild sickness. Mayer reports that 4 out of 6 such children died, and that the others were puny. Lobenstein and Harrar, like Mayer, observed that the size of babies, born of mothers with gonorrhœa, was less than the normal average, basing their conclusions upon 100 children of gonorrhœal mothers (50 with high, and 50 without fever in the puer-

perium), compared with those of 150 normal mothers. The babies of the gonorrhœal mothers gained only 10.9 per cent. at the end of 10 days; those of normal mothers 49.3 per cent.

The influence of gonorrhœa upon the puerperium probably depends, as in bacterial invasions at other times, upon the virulence of the organism, the susceptibility of the mother, and amount of traumatism in labor; although it has been stated that gonococci of apparently slight virulence may become active at this time and rapidly increase in number.

Bumm and others have shown that the lochia is a favorable medium for their growth, and Krönig and Leopold that they may be the cause of puerperal fever, although their presence in the uterus does not necessarily imply an infection. Other writers have reported high fever, general peritonitis, thrombosis, and septicæmia from the same cause. In spite of all this, some have maintained that the gonococcus alone did not produce high fever, and that all such cases were mixed infections from the start, or secondary infections made possible by the influence of the gonococcus. The fact is now quite generally recognized (Krönig, Döderlein, Leopold) that the temperature in puerperal fever from this source is usually moderate; but may occasionally be high. Chills are rare, but it is important to remember that they have occurred in some cases, and that in certain instances, what has proved to be a pure infection with the organism of Neisser, has presented every symptom of a streptococcus infection.

At the Boston Lying-in Hospital, after repeated sterile cultures from the apparently septic uterus of a patient with high fever after delivery, gonococci were grown in profusion on a special culture medium and this was the only organism ever found.

Opinions differ as to how soon after labor the temperature manifests itself, and also as to the significance of early and late fever.

Krönig, among 50 women with gonorrhœa, saw only 9 without fever in the first few days after delivery, and Bishoff states that 50 per cent. have high temperature within the first 14 days. Steinbüchel gives 2.23 per cent. of infected women as having a temperature of 38.5° C. Of 8 cases which he followed farther, 6 had severe pelvic trouble from 2 to 12 weeks after labor. Löwenstein says $\frac{1}{4}$ have high and $\frac{3}{4}$ mild fever.

The highest temperature in our own cases, who had gonorrhœa in its chronic form, with gonococci demonstrated before labor in the cervix was 100°F. and lasted for only a few days. One of these had gonorrhœal rheumatism during the pregnancy. The temperature in the case referred to at the Boston Lying-in Hospital reached 104–105°.

Veit gives details of 5 cases of acute gonorrhœal infection shortly before and after labor, all 5 suffering from severe pelvic peritonitis, with high fever and rapid pulse.

Mayer, in 6 cases, all of which had gonococci in the lochia, found that the fever started in the first days of the puerperium and that the fever was high, with remissions, and intermissions of some days. In one case the fever reached 41.2° C. and the picture was that of a strepto- or staphylococcus infection.

In all these cases, as well as in some published by other investigators, only the gonococcus could be found as the cause of the disturbance.

Franz, on the other hand, was able to demonstrate pathological organisms beside the gonococcus in all of his gonorrhœal cases which had high temperatures—amounting to 7.9 per cent. of his cases.

Mayer has suggested that the higher the organisms ascend in the genital tract during pregnancy, the sooner the fever manifests itself after labor. It cannot be said at the present time, that the late appearance of fever in the puerperium is diagnostic of gonorrhœal infection; but the consequences for the patient seem more serious when temperature comes late in the puerperium, as this is apt to mean an extension of the process to the tubes and possibly to the peritoneum.

Abscess of the Fallopian tubes may rupture during labor or a leakage from the same source start a new pelvic or diffuse peritonitis. Luckily, diffuse gonorrhœal peritonitis is rare, Hunner and Harris reporting 39 cases, including their own,—18 with bacteriological and 21 with clinical proof. Five out of 19 operated, and 8 of 15 unoperated cases, died.

The average case of gonorrhœal puerperal fever need cause little anxiety as regards life; but many are followed by a slow and tedious involution of the uterus, to say nothing of the danger of extension

to other parts, necessitating operation in the end. The possibility of severe peritonitis and general infection is also not to be forgotten. Olshausen has seen two wives of the same husband die of gonorrhœal infection in childbirth, and both Zweifel and Leopold have felt obliged to operate for gonorrhœal peritonitis after labor.

The opinion of Krönig and Döderlein is exactly the opposite, viz., that gonorrhœal peritonitis is never fatal, but in a recent article from the Clinic of Leopold, the presence of gonorrhœal infection is considered unfavorable and even disastrous for both pubiotomy and Cæsarean section.

Beside the emergencies, every gynæcologist sees a long line of women who suffer from obscure infections after delivery, the obloquy of which often falls upon nurse or physician.

Although opinions vary in many respects on very essential points, there is no doubt that gonorrhœa and its relation to pregnancy is a subject of great importance to the community; both from a moral and material standpoint.

It is responsible for about 50 per cent. of all sterility; for 40 to 50 per cent. of the blind in our asylums, and for 10 per cent. of all the cases treated at the Massachusetts Charitable Eye and Ear Infirmary.

There seems to be good reason to believe that it is the cause of some abortions and the bringing of sickly children into the world. The extent of its deleterious effects upon the life, health and future happiness of mother and offspring, and its dangers for both, are not understood by the laity and are unfortunately unappreciated by many physicians.

The greatest task of the near future, devolving upon the medical profession, is the education of the public regarding this venereal disease.

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PREGNANCY COMPLICATED BY UTERINE FIBROMATA IN A HEMIPLEGIC.*

BY LOUIS FRANK, M.D.

**Professor of Gynecology and Abdominal Surgery in the University of
Louisville, Medical Department, Louisville, Kentucky**

GENTLEMEN:—This patient, a female, aged thirty-two years, comes to the clinic for the first time this morning. We will proceed to make our physical examination and discuss the case from a diagnostic standpoint. You have probably found from experience that it is not only operative technique that you have to study; for, as a matter of fact, the mechanical part of your work will probably be the easiest of all in connection with abdominal and pelvic surgery, with certain provisos, of course. By this I mean that the man who thoroughly understands his anatomy and pathology can easily acquire the necessary operative technique. Anybody can make an incision into the abdominal cavity and tie off structures which are palpably diseased. Almost any man who possesses a fair degree of ability, without any definite knowledge of pathology or even the symptomatology of abdominal and pelvic disease, will be able to do a certain amount of work in the abdominal cavity; as a matter of fact a great deal of such surgery is being done at the present day. I think one of the most difficult things about abdominal surgery, and this applies to other fields as well, is the study of symptomatology, and in connection therewith the ability to make a correct diagnosis. In my opinion this is really of more importance to the patient than the ability to perform the required surgical operation. Even a butcher can cut off an arm and the patient will sometimes get well. Any reasonably skilled surgeon, if he will have his hands and instruments clean, can open the abdomen and tie off a diseased appendix, can open and drain the gall-bladder, etc., but the ability to make a correct diagnosis and know

* Clinical lecture delivered at the University of Louisville, Medical Department.

in advance the condition with which you have to deal, to be certain what you are going to do before you open the abdomen, is quite another matter. It is too late after you have an arm off, for instance, to make the diagnosis and to determine by further investigation that the amputation was unnecessary. I would say, then, that the actual operative work is comparatively easy, but a great deal depends upon our ability to make a correct diagnosis, which can only be done by a thorough study of the individual patient and the history presented. After the diagnosis has been made, the next important step is thoroughly to understand the pathology with which you have to deal and then perform such operative procedure as may be required to restore your patient to health. For these reasons we will at various times during the present course have patients brought before you purely for diagnostic purposes; such cases will be discussed with you. We will decide as to the diagnosis, and outline the proper methods of treatment.

The following is a very sad commentary which we must make to-day as regards the position which many men occupy in relation to surgical diseases, and this statement is especially referable to their ability to make a correct diagnosis sufficiently early to be of the greatest value to the patient. Almost anyone can make a diagnosis of pneumonia late in the disease; anyone can make a diagnosis of carcinoma of the stomach when the patient is about ready to die; anyone can make a diagnosis of appendicitis when he finds a large mass at the characteristic point in the abdomen, when his patient has a high range of temperature with every evidence of the accumulation of pus; anyone can make the diagnosis of gall-stones when calculi are passed by the bowel, or when there is obstruction to the common duct causing intense jaundice,—but that is not what we want. We have patients referred to us every day who have perhaps been under observation for weeks or even months in an effort not only to make a correct diagnosis but waiting for the proper time for surgical intervention. In any surgical disease, no matter what may be its character, a prompt and thorough investigation should be made, and your diagnostic ability should be such that you will be able to make your diagnosis early, thus lessening the amount of surgery necessary and at the same time giving your patient a better opportunity

for complete recovery by performing operative work in the presence of the minimum pathological change.

Take for instance the gall-bladder disease: If relief is to be expected we know it must come from surgery. There is absolutely no medical treatment of gall-stones which can offer any measure of success. If stones have formed, or if there is infection of the gall-bladder, the treatment is distinctly surgical. Operation for gall-bladder disease, if performed early while the infection is confined to the gall-bladder itself, is one in which the mortality is almost *nil*, and results among the most favorable in the entire domain of surgical treatment. The mortality attending gall-bladder surgery is less than one per cent. in the hands of experienced surgeons. On the other hand, the mortality in neglected cases, after suppuration has taken place in the gall-bladder, and other complications have developed, is much higher. Where calculi have become impacted in the cystic duct and occlusion has resulted therefrom a more extensive operation is required, prolonged drainage of the gall-bladder becomes necessary, and under such circumstances the mortality is necessarily higher than when surgery is resorted to early in the course of the disease. It is these neglected cases which make the small per cent. of mortality. It must be remembered that obstruction of the common duct producing jaundice is oftentimes one of the late symptoms in gall-bladder disease, indeed it may never be present. You will therefore see the importance of early diagnosis which can only be made by careful unbiased study leading to the diagnosis by exclusion, and then of early surgical intervention.

This woman says she is thirty-two years of age, married, mother of several children, that her menstrual periods ceased three months ago, last pregnancy thirteen months ago, character of last labor dry, that she has had one miscarriage. She has complained for the last three years of pain on both sides of her abdomen, in the ovarian regions, and says she believes she has a tumor of some kind within the abdomen.

In studying the history of pelvic diseases of women we must remember that there are several "gynæcological land-marks" to be considered. The history of the patient, time when menstruation began, its character and duration, the intervals between

menstruations, etc., all these play an important part in the pelvic diseases of women, and especially in the diagnosis of disorders connected with the generative organs. The fact must not be forgotten that the menstrual history normally is not the same in all women, that there are quite extensive differences always within certain limits, so it is first important to get the menstrual history of the patient. Another important so-called land-mark is anything of interest which may occur in the history of the patient after marriage. Many times this will be found to play an important rôle in the diagnosis of pelvic disorders. We do not have to ask the woman whether she is chaste, we know by our examination whether this is true or not. Sexual intercourse, whether practiced in or out of wedlock, produces similar results on the genitalia of the female. Another thing we must not lose sight of is specific infection, no matter what station of life the patient may occupy, and by this we do not mean to imply unchastity or impurity on the part of the woman. We know that not infrequently men have, ignorantly or otherwise, been guilty of infecting their wives with gonorrhœa. Many times it is an infection contracted years before and which was supposed to have been cured, but in which there remained within the urethra an infective focus sufficient to transmit the disease to the woman by means of sexual intercourse. When we secure the history of pain and discomfort in the pelvis developing some time after marriage, the possibility of an infection should be borne in mind, and this becomes an important land-mark in the study and diagnosis of pelvic disorders of women.

Another point is the child-bearing history of the patient. While it is true many women have no elevation of temperature following labor, and that few labors are now followed by sepsis, thanks to our advanced methods of cleanliness and preparation, still notwithstanding this there are troubles which follow parturition referable to the pelvic organs. Infection of the genital tract may occur which is not sufficiently severe to keep the woman in bed for any great length of time, which is attended with practically no elevation of temperature or one so slight as to cause no suspicion on the part of the patient, which is without much pain but is a slow subacute process which may after a time produce marked

disorder higher up in the genital tract, in the pelvis, about the tubes, ovaries, etc. So the child-bearing history becomes another very important land-mark in the study of pelvic and gynecological disorders.

Advent of the menopause must also be given due consideration. Re-establishment of menstruation after the menopause, or hemorrhage from the uterus coming on after the menses have ceased, bears a close relationship to malignant disease of the uterus. In too many instances malignant disease of the uterus develops and is permitted to reach a stage where there is absolutely no chance of a cure being brought about by any method of treatment before the patient is seen by the surgeon, because this land-mark is not kept in mind, because it is not studied, because no attention is paid to it in obtaining the history. Furthermore the various disorders which occur at this period in the life of the woman are too often supposed to be normal and natural consequences of the involution which takes place in the uterus and genital organs about that time. This matter is too often overlooked. Careful attention should be paid to the history of the menopause, as this is a critical period in the life of the woman. Patients come to us not infrequently complaining merely of occasional flooding from the uterus after the menopause has become established, which they say they presume is a natural consequence to cessation of the menses, that Mrs. Smith and Mrs. Brown suffered in the same way and after a year or two the bleeding ceased and they came out all right. The fact is that hemorrhage is not a normal symptom of the menopause; hemorrhage during the menopause should excite the gravest suspicion and the patient should be made to understand the necessity of an immediate physical examination in order that we may prove or disprove the existence of malignant disease, as we recognize that in early diagnosis and immediate operative intervention lies our only hope of cure. Moreover, women during the menopause should be kept under close observation, should be taught the necessity of consulting their physician at frequent intervals, and they should not be dismissed with the injunction to "report again later if the bleeding continues," that they will "probably be all right in a short time." Repeated examinations should be made if necessary and appropriate treat-

ment instituted. It is only by extreme care in this respect, by attention to all the details in connection with the history of the patient, that you will be enabled to make an early accurate diagnosis and give your patient the benefit of that to which she is entitled, viz., what is best in both medicine and surgery!

In your examination, no matter whether the supposed disease be referred to the pelvis or elsewhere, you should inspect the entire abdomen of the patient. You should examine the gall-bladder region, the kidneys, the appendix, the stomach, etc. This is so true that in all abdominal operations at the present day, except perhaps in emergency cases, the surgeon explores the entire cavity after the abdomen has been opened. This is the rule in all planned or set operations where haste is not necessarily an important factor, and such exploration has often demonstrated gross lesions of organs unsuspected before the abdomen was opened, the symptoms before the operation being referable to some other organ or structure. This exploration can be made without additional risk to the patient and takes very little time provided extensive pathological change be not found present.

As I have heretofore suggested to you, in making your investigations, get a clear idea fixed in your minds as to what is conveyed by the examining touch of your fingers, then compare the information thus obtained with what you are able to secure by inspection. Bring into coöperation the eyes and the fingers, and you will find in a very short time you will be able to differentiate between normal and pathological conditions within the abdomen merely by palpation. You will not have to resort to visual examination to find a tumor within the uterus for instance. In the labia or the vagina you may have a cyst, an abscess, a hernia and various tumors, and it may become necessary then to examine by direct vision to determine the exact condition with which you have to deal.

Upon inspection we observe that this patient presents an uneven enlargement of the abdomen. In studying a tumor in the abdomen always note whether it is symmetrical or asymmetrical, whether it is confined to one side or the other, in the lower or upper abdominal zone, its consistence whether hard or soft, movable or fixed. All these are important points in the study of

abdominal tumors, and a good plan is, early in your work, to write out the methods by which you will examine the patient, just how you will study these cases, for you will be given an opportunity to put the methods into practice in our clinical work during the present course.

The first thing we notice is that this patient has an abdominal enlargement, it extends further to the left than the right side, occupying the lower abdominal zone; we notice also that there is some irregularity, and that the enlargement moves slightly with respiration. Palpating this enlargement we find it is soft. This woman has had children, the evidence of enlargement of the abdomen is shown by the striae, which means that the abdomen has been distended beyond the point where the muscular structures could withstand the strain, there has been slight rupture into the skin and these scars remain. We find that the nodule present moves with each respiration. We do not ask ourselves yet what this enlargement may be, but continue our examination. By inspection and palpation we have determined that there is a tumor within the abdomen.

There is one peculiarity which we especially note on palpation, a marked bulging at the median line which completely disappears on pressure with the patient lying down, while moving out toward each side we meet with resistance; so we may say, in passing, that we have here a diastasis of the recti muscles, probably due to overdistention of the abdomen, a separation of the abdominal muscles resulting in a condition resembling hernia. There is a diastasis or hernia of the abdominal muscles. There has been a thinning of the fascia with separation of the recti muscles, permitting the intestines to present immediately underneath the skin. By close study we can see the peristaltic movement of the bowel.

In palpating the abdomen always ask the patient to take a deep breath, then a corresponding deep expiration which will relax the abdominal muscles; by having this process repeated you can easily palpate the entire abdomen. We find deep palpation produces some pain, that there is tenderness over the tumor, also rigidity of the muscles. We must remember that pain and tenderness are very important symptoms in suspected abdominal lesions.

Rigidity of the abdominal muscles is also an important sign. This often means more than elevation of temperature and some of the other symptoms usually accorded greater prominence.

The assumption in a married woman presenting a tumor within the abdomen, especially when she has gone three months without menstruating, of course is pregnancy. However, this woman presents no enlargement of the breasts, but pregnancy is always to be borne in mind when women come to you for examination. You are aware that many times the mistake has been made in diagnosing fibroid or other hard tumors, when the condition was really pregnancy, and so proven at operation.

In making your physical examination you may anoint the fingers with soap or vaseline; I prefer soap as vaseline is difficult to remove. Do not use two fingers in making your examination, one is sufficient, and little advantage can be gained by using two. I can make a satisfactory examination with one finger, in any patient who has not a very rigid abdomen, by having her relax the muscles as we have already outlined. One finger is usually enough, but if you desire to reach slightly further, you may use two; you can gain perhaps in this way half an inch which sometimes means a great deal in your examination.

Always feel the labia, palpate the posterior portion of the vagina to ascertain the condition of the muscular structures; we find that the muscle on the left side is very thin and the tissues hard, right side normal. This condition of the left side is probably due to the fact that some of the muscle fibres have been torn during one of her labors. In the vagina we find nothing especially abnormal; the cervix is not enlarged; there is a slight cervical tear posteriorly on the right side, such as usually occurs following labor. We find a large mass in the pelvis, the uterus is also enlarged. We may have here a pregnancy complicated by tumor. We can detect an irregular nodular mass by the side of the uterus which feels very elastic. The tumor extends into the pelvic cavity. On bimanual examination, then, we have satisfied ourselves that there is an enlargement of the uterus, and that there also exists an irregular nodular tumor probably attached to the right cornu, that the cervix is shortened, though not markedly so, and feels hard to the touch.

At this point in our examination it becomes necessary to study the case carefully in order to determine whether there are present any of the symptoms or tangible evidences of pregnancy. Remember that pregnancy must always be proven or excluded in cases of this kind. We will then have to study the probable signs of pregnancy. The first presumptive sign is cessation of menstruation which is present in this case, next come the probable signs of enlargement of the breasts and morning sickness, following these discoloration of the mucous membrane of the vagina, other changes about the breasts, digestive disturbances. In pregnancy you will recall that there is always progressive enlargement of the breasts, and there is usually morning sickness. These symptoms are ordinarily the same whether pregnancy occurs in the uterus, or whether it be an ectopic gestation. I am satisfied that a great many cases of ectopic pregnancy are overlooked, not only before rupture but even after rupture has taken place, the patient being treated for an abortion, the decidua membranes being removed and the patient going on to recovery.

The question of pregnancy in all cases such as the one before us must be excluded. Careful study of the case will usually enable us to do this, though it is not always possible. If we are not able to exclude pregnancy at the time of our examination, we should wait until the supposed foetus has reached an age which will enable us to detect the positive signs of pregnancy, that is until the foetal enlargement has reached the stage where we can make out the outlines of the foetus through the abdominal walls, and by this time other positive signs of pregnancy will also be apparent. But if we are still unable to exclude pregnancy then we ought to wait a sufficient time for labor to occur, in other words, wait until the end of the supposed gestation. I have seen several cases where labor came on in the regular way, where diagnosis of pregnancy had been made, but the women were not delivered, — however, it was proven that pregnancy existed outside the uterus in the abdominal cavity. Of course it is quite impossible to deliver a woman in the normal way when pregnancy occurs outside of the uterus in the abdominal cavity, but living children have been extracted from the abdomen by surgical operation where the foetus had never been in the uterus.

On further inquiry we learn that this woman has had nine pregnancies in ten years. We find that she is now probably pregnant, and that the gestation is complicated by a small tumor or tumors connected either with the ovaries, or they may be fibroid growths attached to the uterus. I would not venture a positive diagnosis until we shall have an opportunity to examine the patient under an anæsthetic. I am unable to palpate the right ovary distinctly, so it may be that the tumor on that side is ovarian in origin.

As we know, pregnancy may take place even in the presence of fibroid tumors of the uterus. I can detect a small mass evidently attached to the uterus which feels very much like a small fibroid near the fundus, there is also a small nodule anteriorly which appears to be a small fibroid. You may recall that we had at the hospital not long ago a case in which pregnancy was complicated by fibroid tumors; we removed the fibroids and while the woman recovered quickly from the operation, she succumbed on the fourteenth day thereafter from pulmonary embolus. We not infrequently see pregnancy occurring in the presence of fibroid tumors, and such cases furnish a most interesting pathological study. In some instances fibroid tumors present insurmountable difficulties to accouchement, and surgical intervention becomes necessary. I remember a number of years ago having delivered a woman in consultation; there was a transverse presentation of which nothing was thought at the time. I saw the same woman in consultation two years later at the birth of her next child; this was also a transverse presentation of which nothing was thought at the time. I saw the same woman in consultation two years later at the birth of her next child; this was also a transverse presentation, and on this occasion we diagnosticated a complicating fibroid tumor of the uterus. This tumor apparently completely disappeared during the next six or eight weeks after the extrusion of the child and nothing more was heard of the case until about two years later when she was again delivered at term. At the time of delivery her abdomen was as large as a twin pregnancy, the fibroid tumor having attained the size of an adult head. The child was in the transverse position necessitating version, and delivery was followed by subsidence of the tumor without any symptom

referable to it since that time. I have seen a number of cases in which pregnancy was complicated by fibroid uterine tumors where the tumor neither gave trouble nor interfered with normal delivery, in fact it did not in any way interfere with the normal course of the pregnancy. On the other hand I have seen many cases of pregnancy complicated by fibroids of the uterus where the tumor became the source of much difficulty during expulsion of the child, where it interfered markedly with delivery. It is remarkable how often tumors of moderate size will cause serious complications, while others much larger will give rise to no trouble. We know that with the advent of pregnancy, if there exists a fibroid tumor which rises in the pelvis as pregnancy advances, little or no difficulty will be experienced in delivery; whereas if the pathology is such that the tumor is fixed in the pelvis there may be a great deal of obstruction to delivery. I have seen cases where the fibroid was wedged in the pelvis so that it seemed impossible for the pregnancy to advance to term in order that normal delivery might take place, but subsequently the tumor would rise up out of the pelvis and the women be delivered without difficulty at term. However, it may be stated as a general rule that fibroid tumors complicating pregnancy may always be regarded as a source of danger to the patient. There may ensue abortion, hemorrhage, sepsis, obstruction to the birth channel necessitating Cæsarean section, the Porro operation, or destruction of the child.

The tumor may, in certain cases, undergo degeneration, cystic in character, following labor, and sloughing may occur from impairment of the blood supply to the tumor itself. I have seen a number of cases where, subsequent to labor, hemorrhage and sloughing of the tumor occurred, necessitating prompt operation. These are always dangerous cases with which to deal. You may remember a case that we saw last summer, where a young woman was thought to be bleeding to death from a retained placenta, but, on examination, nothing could be found. During the next day or two a small fibroid tumor sloughed away and the patient recovered. This patient had become pregnant, miscarried and hemorrhage from the uterus continued, though the cavity was thought to be empty. In some cases the tumor mummifies, is practically destroyed, partially exfoliated, and later perhaps, when we deliver

the remains of a placenta, a small portion of the fibroid may also come away. In others bleeding continues, the woman becomes almost exsanguinated, necessitating prompt hysterectomy to save life. It has been my experience, however, that a great many fibroids, if they are of a certain character, undergo involution after delivery of the child and practically disappear. In other instances, perhaps where the tumor is situated in another portion of the uterus, it may undergo degenerative changes, sloughing may occur, and it then constitutes a very dangerous complication. This is so true that it has been advised by some very eminent authorities that in all such cases the patient should be subjected to hysterectomy, the Porro operation, or even hysterectomy before termination of the gestation, when the diagnosis is made.

In the present case, from the cessation of menstruation, although there appear no changes so far in the breasts, we are led to make the tentative diagnosis of pregnancy. This is complicated with some small tumors of uterine or ovarian origin, or possibly by infective disease of the uterus and the adnexa. Whether this diagnosis will hold good, however, I am not at the moment prepared to say. We will examine this woman again and keep her under observation, and it is only fair to say that we may have to change the diagnosis.

Another interesting thing in connection with the history of this woman is that she has hemiplegia. She is a comparatively young woman, and this condition always causes the apprehension that there may possibly have been a specific infection, that there is some central lesion. This is one of the most frequent causes of hemiplegia as you will remember from your studies of the subject. We further find that following her last labor she had excessive hemorrhage; also that during the last few months this woman is supposed to have contracted gonorrhoeal infection from her husband. I understand her husband has been under treatment in the venereal clinic for specific urethral infection. Whenever facts like this are discovered in the history of a case, it makes the study more interesting.

We have here a history of post-partum hemorrhage, also the possibility of specific infection, it may be of the uterus, almost certainly of the Fallopian tubes, it may be of the urethra as well.

The possibility of specific infection must always be borne in mind. We should not lose sight of the tenderness that is present in the case before us. We find the abdomen painful and tender, and these symptoms are always important factors from a diagnostic standpoint in the study of abdominal and pelvic disease. Pain in this case has been a prominent symptom. The location of the pain of which the patient complains, its character, duration, etc., all this information has an important diagnostic bearing, particularly from a differential standpoint. Certainly one of the most constant symptoms we have in diseases of the abdomen is pain, this notwithstanding the fact that some observers have attempted to maintain that the parietal peritoneum is not endowed with sensory nerves. If this proposition were true there might occur a diffuse suppurative peritonitis without the least pain, and we know this is not a fact; but it is admitted there is some question as to distribution of the nerve supply to the peritoneum and the intestines as well as other structures in the abdomen. When there is disease of any of the abdominal contents pain is a prominent and one of the most constant symptoms, and in acute abdominal disorders its sudden cessation may be regarded as a distinct danger signal which should never be overlooked, one that should make us very fearful as to the outlook and outcome of the case with which we may be dealing. In strangulated hernia, or acute inflammatory disease of any kind accompanied by severe pain, the sudden cessation of pain as a rule means that the disease has reached a critical stage, that instead of improvement the patient will likely in a very short time grow rapidly worse, and dissolution may promptly occur.

Ophthalmology

THE AFTER-TREATMENT OF CATARACT EXTRACTION

A CLINICAL LECTURE

BY WILLIAM OLIVER MOORE, M.D., LL.B.

Professor Emeritus Diseases of the Eye and Ear, New York Post-Graduate
Medical School and Hospital, late Professor of Diseases of the
Eye and Ear, Medical Department, University of
Vermont, etc.

ON the completion of the operation for the extraction of cataract, the cornea and the conjunctival cul-de-sac should be carefully flooded with a warm boric acid solution, in order that all secretions and coagula may be removed, after which a warm solution of mercuric chloride, 1:8000, should be carefully used.

The eyelids should then be closed gently, and over them a small square of old linen placed which is either dry or covered with oleum petrolei, cold cream, or some bland ointment. When the skin of the eyelids is delicate the oiled linen is preferable. Small pads of absorbent cotton are now gently placed over the linen cloths, sufficient in quantity to fill the space between the eyeball and forehead, so that the pressure of the bandage will be uniform and gentle. This cotton may or may not be medicated, as the operator desires. Over this dressing is placed the roller bandage which may be made of baby flannel, in the winter, or of cheese cloth in the summer season. The bandage should be from one and one-half to two inches wide and three yards in length, and applied in the form of the well known figure of 8.

As a rule, only one pin is required to fasten the bandage, and this the ordinary one; I have never seen a bandage properly applied where *one pin* was not sufficient to hold it in position, except in those having long hair. It is my custom in such cases, besides using the pin as mentioned, to fasten the bandage by means

of a hairpin passed through it and into the back hair, thus securing it, or to put on an old-fashioned night-cap over the bandage, thus keeping the bandage securely in place.

I am fully aware that all that has been said as to the bandage may be considered by many to-day as unnecessary and antiquated, and that we are only called upon to place bands of water plaster, or any adhesive strap over the closed eyelids, and all will go well. We must admit that this is true, and I have seen *one case* in which no dressing save a shade was required. Judging from such results I should commend this plan, although it must be admitted that the patient has far more comfort if a bandage is applied.

After the application of the bandage the patient should be carefully led to bed and allowed to assume any position that is comfortable and easy. The old practice of keeping patients in bed on their backs for the first twenty-four hours is cruel and uncalled for. The only caution necessary is that the eye be not struck by the patient's hands or the pillow cover. The patient may have freedom in micturating, for great inconvenience and annoyance are often caused by the attendant insisting on the use of urinals. At the end of twenty-four hours or earlier, if the patient is restless, a sitting posture may be assumed, the patient being partially dressed, and the use of an easy chair may be allowed. Many patients have done badly in the past from too rigid observance of the old ideas of after-treatment. In aged persons congestion of the pulmonary organs may be set up by the rigid enforcement of rest on the back.

It is my custom to leave the bandage on both eyes for four days without change, unless severe pain is experienced, in which case it is immediately removed, the eyelids bathed with a mercuric chloride solution (1:10,000), the lids gently opened and the eye carefully inspected. When no pain occurs after the operation, and there are no untoward symptoms at the end of four days, the bandage is removed *for the first time*, and, after the use of the mercuric chloride solution as above described, the eyes inspected.

It is taken for granted that the room in which the patient is placed is moderately dark and that no direct sunlight falls in the apartment.

We have no sympathy with those who keep the room absolutely dark,—in fact, so dark that the blackness can “be felt.” Such darkness not only injures the health of the patient, but is also a temptation for attendants to keep the room untidy, thus favoring germ development. It is to be hoped that such a practice will be abandoned, and that instead of *the room being made dark*, the patient’s eyes only shall be properly shielded during the healing process by placing a fold of black silk or muslin over the applied bandage.

If upon inspecting the eye, no undue redness is noticed, and if no evidences of iritis are present, a mydriatic need *not* be used, but should the pupil be narrow, and the eyeball quite red, then atropine sulphate (gr. 1—ounce $\frac{1}{2}$) in water or oil, should be instilled twice daily.

The bandage need not be applied over the unaffected eye after the fourth day, it being sufficient, usually, to shield it by means of a shade.

On the eighth day we usually remove the bandage from the affected eye in the morning and have the eye shaded only during the daytime, re-applying the bandage at night. London smoked glasses are very useful as protectors, and with a shade over these glasses there is ample protection against the light. If the healing proceeds well, the patient may have the freedom of the room for exercise, being properly guided by an attendant; and at the end of four weeks the lenses may be adjusted and the patient is allowed to resume his occupation.

In an experience of six years at the Mary Fletcher Hospital, at Burlington, Vermont, the average duration of hospital treatment was ten days, and in New York at the New York Post-Graduate Hospital, during a period of twenty years, it has not exceeded fourteen. The shortest period of hospital treatment was in a male, aged ninety-one, who remained in the hospital five days, at the end of which time he was allowed to return to his home. The wound healed thoroughly and the eyeball was pale. This is one of the shortest periods of treatment on record. This patient was seen by one of my colleagues who remarked that he should have thought, from the appearance of the eye, that three weeks had elapsed.

In cases in which pain occurs, and in those in which on removing the dressings pus is found on the linen pad in considerable quantity, it can be safely concluded that purulent infection of the wound has taken place. The eyelids being opened the corneal wound will be found infiltrated throughout its entire extent, and perhaps pus will be found in the anterior chamber. The best treatment is to wash carefully the eyelids with a mercuric chloride solution (1:8000), and to cauterize the corneal wound throughout its entire length either with the galvano or thermo cautery, thus attempting the destruction of the infecting organism. Applications of hot water, as hot as can be borne, for ten minutes, repeated every two hours, will greatly relieve the pain and cut short the suppurative process. Atropine sulphate (grains 2—ounce 1) used every two hours keeps the iris out of harm's way, and when combined with cocaine hydrochlorate greatly mitigates the pain. To re-open the wound, and remove the exuded material from the anterior chamber by forceps is of no avail; nor is the injection of Pana's fluid into this space advisable. The eye should be shielded from light in all such conditions.

Purulent infection of the wound and attendant suppurative iritis usually result in closure of the pupil and a drawn up iris, while in rare instances the infection may even go on to panophthalmitis. The closure of the pupil as the result of this suppurative process reduces vision to perception of light. This condition of closure of the pupil is best treated by *iridotomy*, which may safely be performed a few weeks after subsidence of inflammation.

Iridotomy may be performed by means of de Wecker's method—that is, by using the specially made stop-keratome, or iridotomy knife and the iridotomy scissors, both of which he has devised. The scissors, or at least those that we have used, are objectionable in that being forcep-scissors they cut unevenly, that is to say they bind at the heel of the instrument, and not well at the extreme point, so that the iris is bruised rather than cut, and thus iridocyclitis is apt to be set up. De Wecker's operation may be single or double, according to whether the iris is incised once or twice. The operation may be done under cocaine anæsthesia.

The iridotomy knife is introduced in the same manner as for

an iridectomy—that is, about one-fourth of an inch from the corneal margin, the instrument being held perpendicularly to the eyeball, and by gentle pressure forced into the corneal tissue, and into the anterior chamber until the stop of the knife reaches the cornea, so that in this step of the operation the knife-blade is in the anterior chamber, in front of the iris and occluding membrane, and behind the cornea. The knife is now partially withdrawn and its point pushed through the iris tissue or membrane, thus making an opening for the subsequent introduction of the iridotomy scissors. The knife is then quietly withdrawn, and the iridotomy scissors, with their blades closed, introduced through the corneal incision (which is at the superior border) into the anterior chamber. One blade is then passed through the opening made in the iris tissue or membrane (or both), the other blade being in front, the forcep blades of the scissors are pressed together and the tissue between the blades severed.

If there is elasticity to the tissue incised a fair opening will be noticed immediately. If one incision is not sufficient to obtain a good pupil the blades may be placed in another position, and a second incision made to connect with the first, thus forming an inverted V, or cordiform pupil. In rare instances the parts cut will not retract, and we have to resort to *removing* a piece of the iris tissue.

In treating these cases of closure of the pupil after purulent iritis, I prefer the simple iridotomy, with an ordinary cataract knife, for the procedure is simple, less manipulation is required and the danger of reaction is less.

Iridotomy with Cataract Knife.—After the eye is cocaineized the speculum and fixation forceps in position and the eyeball securely fixed, a sharp narrow Graefe cataract knife is thrust through the cornea above and toward the peripheral portion into the anterior chamber; the point is then thrust through the iris and membrane tissue into the vitreous chamber, and by a rapid downward cut the parts are divided, so that as near as may be the resulting incision will fall opposite the corneal centre. The knife is now withdrawn, with which a small quantity of aqueous escapes, and the wound of entry closes immediately. This simple iridot-

omy is very effectual, and is to be highly recommended. Failure, at the first attempt, to secure a sufficient opening by means of the simple iridotomy, may be followed in a fortnight by a second endeavor which usually succeeds.

The after-treatment to be adopted after either of the foregoing forms of iridotomy includes rest, a bandage and the use of atropine sulphate (gr. 2—ounce 1) t.i.d. for one week. At the end of this time any reaction that may have occurred will have subsided. As soon as the eye has recovered from the operation, and all redness has disappeared lenses may be adjusted.

Prolapse of the Iris.—This is more especially liable to occur in those patients on whom no iridectomy has been performed, or after what is called the "simple operation." Even after the dressings have been adjusted or during the interval between the operation and the first removal of the bandage this accident may take place, even in those patients in whom no prolapse occurred at the time of the operation. This accident I have frequently seen in the practice of others (I prefer the compound operation). It is often caused by some undue exertion on the part of the patient, such as coughing or sneezing, which has forced the iris through the open wound.

When this condition is found, gentle efforts should be made to replace the iris into the anterior chamber by means of a spatula, but in our experience this method rarely succeeds; and though eserine sulphate is also strongly advised by others, this method we have rarely seen effective. Mydriatics and myotics do not act on the iris with any degree of satisfaction when the anterior chamber is leaking.

When the iris cannot be replaced or reposed by means of a spatula, we should emphatically advise its excision by iridectomy. The treatment suggested by some, to allow the incarcerated iris to heal in the corneal wound, is, without question, dangerous. In certain cases of extraction performed by the "compound method" a portion of the iris will, occasionally, become entangled in the angle of the corneal incision, and in such it is advisable to re-introduce the forceps and free the entanglement by removing a piece of the iris tissue. One should then carefully rub the iris

back from the wound by means of a spoon, pressing on the cornea over the point of the recent difficulty. This condition is exceedingly rare, if the precaution has been taken after the extraction to inspect the wound carefully before applying the dressings.

Prolapse of Vitreous.—This condition is occasionally found when the dressings are removed, prolapsed vitreous showing as a small head in the centre of the corneal incision, or in other cases occupying the whole length of the wound. Healthy vitreous presenting thus in the wound acts as a foreign body and a wedge, and prevents the healing of the parts. In the cases that have come under our observation we have found that a change from the former recumbent position and one of great repose to that of the erect posture and active exercise has done much to cause the vitreous to recede. By active exercise we mean walking to and fro in the apartment or ward with considerable freedom. Some advise cutting off the protruded vitreous by scissors, and then applying the bandage; some even advise using a delicate suture in the cornea. The first method suggested is *always* preferable.

Entropion of the Lower Lid.—This complication is occasionally the cause of much annoyance in the after-treatment of cataract, since the inverted lid causes irritation and conjunctivitis. The quickest way to relieve the condition is to remove an elliptical portion of the skin of the lower lid and then unite the edges, thus producing shortening of the lid; many patients will not, however, submit to this operation. Straps of plaster may be placed close to the ciliary edge of the lid, and the lid drawn down by fastening the other extremity of the plaster on the cheek. This is unsatisfactory, as the tears soon cause the plaster to give way. Again the lid may be held down by the finger and the patient directed to look up, and while in this position an application of flexible collodion may be made to the skin of the lid along its entire length and parallel to the ciliary border. When the collodion is fixed the lid may be replaced. Usually this procedure will prevent the entropion for twelve hours, at the end of which time the collodion may be re-applied. In addition to these local measures, the fluid extract of conium will be found useful for some patients in allaying any muscular spasm, for it has especial

action on the muscles about the eye. It may be given in fifteen drop doses every three hours.

Delirium after Extraction of Cataract.—This has long been noticed and at first was thought to be due to atropine poisoning; but such an explanation cannot hold, since delirium has occurred in patients to whom atropine has not been given. It is not a surgical delirium, as the shock in cataract operation is of no importance. It is probably due, in feeble patients whose physical and mental makeup is low, to the deprivation of light, for it has been observed in patients suffering from other affections who have been confined to dark rooms. Should this condition occur, it is evident, therefore, that the removal of the bandage and the use of a shade or London smoked glasses is called for.

Stripped Keratitis.—This condition is occasionally met with during the healing process, and may show itself in different degrees of intensity from a few bands to a complete opacity of the cornea. It is due to changes in the endothelial layer of the cornea produced by traumatism during the extraction. It usually clears up in a few weeks; only rarely does a permanent opacity of the cornea remain. *Lachrymal diseases* often co-exist with senile cataract, and may persist even in those cases in which the precaution has been taken to operate upon the diseased lachrymal passages before the extraction.

Septic secretions forming beneath the closed eyelids are prone to linger. To relieve this condition some prefer to use a fine powder of iodoform, dusting it along the corneal wound, and though the procedure is attended with good results, an objection is to be found in the disagreeable odor of the powder. Our habit, in such cases where any tendency to lachrymal disease exists, is to remove the bandage the second day, and not to replace it save at night, being satisfied during the day to protect the eye from undue light by means of smoked glasses and a shade. By bathing and washing out the conjunctival cul-de-sac with mercuric chloride solution (1:8000), we are sure to prevent infection of the corneal wound from the lachrymal secretions. In other words, these should be treated as open wounds.

Pain a few hours after the operation is frequently noticed,

and is to be more or less expected when the natural sensations of the parts are returning, and from the sting and smart of the operation itself; if, however, the pain and discomfort do not speedily subside, it is wiser to remove the dressings, without exposing the eye, and pull down the lower lid very gently for sufficient distance to allow any pent-up tears to make their escape. Frequently by this simple procedure entire relief will be given the patient. The dressings should then be re-applied. Neglect to attend to such trifles will often retard the healing process.

Membranous or Secondary Cataract.—In the majority of cataract extractions, the capsule thickens, wrinkles or becomes more or less opaque, causing what is termed secondary cataract, this appears from a few weeks to several months after the operation. This is so often the case that most operators explain to the patient before the extraction the probable necessity of a secondary operation or *needling*, before they may obtain the full acuteness of vision. This membrane being in the line of vision, of course materially reduces the acuteness of vision.

So long as we continue the present mode of extraction by lacerating the anterior capsule and leaving the capsular mass in the interior of the eye, we must expect these secondary membranes. The ideal operation is to remove the lens in its capsule, which may be done either by design or accidentally. As a safe plan of operation, however, it has been generally abandoned.

In many the membrane shows at the very outset, and even when the healing process is satisfactory; it can be best seen by oblique light as a gray film stretched across the pupillary region, and by the ophthalmoscopic mirror appears as a cobweb-like material, wrinkled and sometimes looking like watered silk, the reflex of the fundus showing through it. The density and opaqueness of the capsule cause more or less diminution of sight. Operations for secondary cataract should not be attempted until all symptoms of inflammation have disappeared.

Before needling, the pupil should be dilated fully by a mydriatic, the eye anæsthetized by cocaine, a speculum introduced, or the eyelids be held open by the fingers of the operator. Some operators prefer the speculum and fixation forceps—in any event

the eyeball is fixed. A fine cataract needle is passed through the cornea perpendicularly to its surface, the point entering its tissue near the periphery, and then through and into the capsular membrane, then by a rotating motion of the handle of the instrument, a rent is made with the point in the cobweb-like substance. Care should be taken that no undue traction is made upon the ciliary region, as cyclitis may be set up by excessive manipulation. When the membrane is very delicate and thin, we can determine if the result has been accomplished by having an assistant concentrate light upon the cornea with a strong convex lens. If a sufficient opening has been made by the needle, it may be quickly withdrawn; the wound of entry is insignificant, and closes immediately on the withdrawal of the needle.

When on the introduction of the needle into the membrane the capsule moves with the needle without tearing, a second needle should be introduced on the opposite side of the cornea, the points of the two needles should be brought together and then gently separated, causing by this motion a rent; or one needle may remain fixed and the other used to tear the membrane in a direction away from the first needle; this procedure will usually cause the densest membrane to give way. Occasionally the opaque capsule will move to and fro in the pupil and cause the patient much annoyance, or the opening made will contract. In such cases it is wise to do an extraction of the capsule by making an incision at the upper border of the cornea with a keratome, and then introduce into the anterior chamber a sharp hook, which is entangled in the membrane and then carefully withdrawn through the corneal incision; delicate scissors should then clip off the capsule mass. If the hook fails to bring the capsule into the wound, delicate iris forceps may be introduced into the anterior chamber and the capsule grasped by their blades, and then drawn into the corneal wound and excised by scissors. If the original extraction has been done without an iridectomy, care must be taken not to engage the instruments in the iris tissue; and if, by chance, the iris should prolapse, and one cannot replace it by a spatula, it is best to excise it.

Treatment after either of these operations includes rest, a bandage for forty-eight hours, and atropine instillations three times

daily. For pain, hot water applications, cocaine, and adrenalin may be used with marked effect.

Cystoid Cicatrix.—This occurs after extraction, especially if the case has not been found to have the angles of the wound free of iris tissue on the completion of the operation. It may also occur during the healing process if this is protracted and thinning of the sclero-corneal junction has taken place in consequence. It is best to remedy this defect at once, for if it is neglected, it is likely to lead to iridocyclitis. Iridectomy usually gives relief.

THE VISION IN SOME EYE DISEASES

BEING CASES FROM AN OCULIST'S NOTE-BOOK

BY LESLIE BUCHANAN, M.D. (Glasg.)

As it frequently occurs that cases of considerable interest are seen in private practice and, after an interval of time, more or less completely forgotten, it has occurred to the writer to look through his case-books for the last twelve or fifteen years for instances of this kind and to put the result together in the form of a paper.

In stating the cases, the utmost brevity has been exercised as, in most instances, only one point has been aimed at and it is hoped that although not claiming to be unique the notes will be found interesting and perhaps helpful.

While endeavoring to keep the paper as short as possible, no necessary or useful detail has been omitted where it is possible to give it, but even private case-books do not always contain all they might and so faults of detail will be pardoned.

TWO ATTACKS OF RETINITIS ALBUMINUR. EX PREG. RECOVERY

CASE 1.—E. A., age 29, was first seen in Aug., 1894, suffering from albuminuric retinitis after pregnancy. She had, after her confinement in May, 1904, eclampsia and general œdema, and was practically blind. When seen first by me, her vision was only "fingers at two feet" with each eye. She was very weak and anæmic and had œdema of the face and feet. The urine was loaded with albumin and contained a deposit of tube casts and cells, Sp. gr. 1017. In the eyes, the changes found were characteristic of albuminuric retinitis of severe type. Many hemorrhages and white glistening spots were seen in the retina of each eye, the latter principally in the macula region.

Under treatment by acetate and iodide of potassium with iron for three months she recovered full vision; the retina completely recovered also, no traces of the past affection being visible; the urine was free from albumin.

In the beginning of February, 1895, she came again on account of a renewal of the symptoms, being at that time five months pregnant. It was found that the vision was $\frac{5}{80}$ each eye, and in the fundus of each eye changes were found similar to those previously seen. The urine was loaded with albumin as before. The pregnancy terminated at seven and a half months without eclampsia and I saw the patient last in October, 1895, just about to start for South Africa. She was perfectly recovered, had full vision and the urine was free of albumin.

It is a matter of common knowledge that retinitis in the course of a pregnancy is quite a different thing, so far as prognosis goes, from the retinitis in nephritis of other origin, but it must be only very rarely that an individual goes through two attacks and comes out practically scathless.

NEURO-RET. ALBUMINUR. OF LONG DURATION. FULL VISION

CASE 2.—D. M., age 41, seen first in May, 1899, complaining of headaches. Vision was $\frac{5}{80}$ each eye. In the fundus of each eye neuro-retinitis of such appearance as to suggest albuminuric origin. Urine examined and found loaded with albumin and a deposit of blood, tube casts and cells.

The optic nerves were greatly swollen (height 4D) at all parts except where the papillo-muscular bundle emerges. At the outer part, while the nerve outline was indistinct, it appeared to be of normal elevation. Elsewhere, there were white patches of exudation and hemorrhage on the enlarged nerve head and on the retina also. Small and medium sized white spots of exudation were found around the macula but not in it. The visual fields were full.

The patient was a thin wiry man who took a great deal of exercise, walking about thirty miles a day as a tea traveller. He was not aware that there was anything the matter with his kidneys and had always been healthy although thin. The headaches were neuralgic in character.

He was ordered suitable treatment and diet, but, in spite of all advice, steadfastly refused to stop work and went about in all kinds of weather with only the lightest of clothing. The eyes continued in much the same state for six months, the vision remaining $\frac{5}{80}$ and the fundus showed no change. Later the neuritis began to subside,

and with the spots in the retina, almost disappeared during the following eight months. The urine did not improve in any respect during this period of fourteen months. The vision still remained at its former point.

Three months later he came again and it was found that the eyes were improved so far as the fundus appearances were concerned, no trace of spots being visible and the neuritis nearly subsided. The vision still $\frac{5}{6}$, and the man still walking about. Urine now rather worse. A month later he died of uræmic poisoning.

The escaping of the macular fibres was an interesting feature in this case.

OPTIC NEURITIS OF LONG DURATION. FULL VISION

CASE 3.—T. T., age 27, first seen in Dec., 1903, complaining of headache and weak sight. Vision: R. $\frac{5}{6}$, L. $\frac{5}{6}$; O. E., R. & L. Very intense optic neuritis with great swelling of the nerve heads (height 6D) and extending for fully three discs' breadth in diameter. The retina around the nerve was folded and œdematous, and the vessels were very tortuous both laterally and antero-posteriorly. There were many and large hemorrhages on the nerve and surrounding retina.

The headaches were worse on the left side and were spasmodic in character, but there was rarely a completely free interval. There had been some vomiting, but it was not frequent or characteristic. The patient's history was good, nothing visible in the way of syphilitic or tubercular lesions, except two small glands in the neck. No history of syphilis or of injury.

The treatment was mercury and iodide of potassium and under this the vision soon improved although the neuritis continued as intense as before the medicine was ordered.

The man remained in much the same state for nearly two years, the headaches as bad as ever and requiring the use of opium, the neuritis as intense, as judged by the height of the elevation and the renewal of hemorrhages, and the vision still perfect. Matters now began to improve, the headache and neuritis gradually disappeared and by the end of May, 1906, the man was practically well and still retained full vision.

P.S. May, 1907. The man is still well and retains his vision as before.

The cause of the symptoms in this case was obscure; it may have been syphilitic, or it may have been tuberculous. Treatment was varied somewhat but the iodide of potassium was used freely.

METAL IN AN EYE FOR THIRTY YEARS. FULL VISION.

CASE 4.—J. S., age 47, consulted first in May, 1905, on account of catarrh of the left eye. V.A.R. $\frac{5}{16}$, V.A.L. $\frac{5}{8}$.

History was that thirty years ago, while working as an engineer, he was struck on the right eye by a chip of metal. The eye was sore at the time and almost completely blind but slowly recovered sight in the course of a year. It was only after some years that the presence of the metal in the eye was discovered and, as it was quiescent, no attempt was made to extract it.

When seen there was a chip of white, shining metal lying embedded in the fibrous tissue, partly in and partly on the retina, just below the optic nerve. Around this there was an area of chorioidal disturbance of about two discs' breadth, probably the result of sub-retinal hemorrhage. The eye was perfectly quiet and the tension normal. There was absolutely no staining of the tissues at any part and the detail of the fundus was seen with absolute distinctness. The refraction was mixed astigmatism and correction of the error gave almost perfect vision $\frac{5}{8}$.

The metal was supposed to be steel so that rusting might have occurred. It must be taken, therefore, that the chip was so perfectly encapsulated, although it was clearly visible, that fluid did not gain access to it. The result at all events was most satisfactory and, needless to say, no suggestion as to removal of the chip was made.

EXTENSIVE CHORIO-RETINITIS. FULL VISION

CASE 5.—A. H., age 21, was first seen in July, 1903, on account of convergent strabismus of many years' duration. He was wearing a correction of + 4D sph. each, obtained three years ago. He made some complaint of slight night-blindness.

V.A.R. $\frac{1}{16}$, L. $\frac{5}{16}$ without correction. With correction R. $\frac{5}{8}$, L. $\frac{5}{8}$; O.E., R. & L. There are very well marked pigmentary changes in all parts of the fundus of each eye, extending as far as can be

seen to the periphery and also quite into the macula region. There are areas of pigment denudation and atrophy of the chorioid with extensive massing of pigment round the margins. Other areas are densely pigmented all over. The changes are equally intense in the eyes and there is nothing in the appearance of the fundus or in the localization of the changes in the left eye to account for the difference in visual acuity.

There were no changes which could be considered as recent. The visual fields were practically normal. A very careful correction of the right eye brought the vision quite up to the normal,

+4D, S. \odot +5D, Cy. ax. 90 gave V. R. = $\frac{1}{2}$

but no correction of the left eye improved matters in the least.

The five cases just recorded make an interesting study and illustrate very well the extreme difficulty which is often experienced of foretelling the visual acuity, even approximately, from the state of the fundus.

ASTHENOPIA INDUCED BY UNPLEASANT ODORS

CASE 6.—J. M., age 19, a chemist, came in Feb., 1901, complaining of great irritability of the eyes and of headache. He had been working in a laboratory for four years and had no trouble until a month ago. He was wearing a correction for astigmatism obtained some six years ago and which had always given satisfaction. He was a nervous, high-strung man.

He stated that he noticed very distinctly that closeness of the atmosphere or dustiness at once caused discomfort, and then that odors which were unpleasant or poisonous started pain in the forehead and eyes. Soon after this he found that odors which were pleasant soothed the pain. Sulphuretted hydrogen and bisulphide of carbon were conspicuous as causing pain and orange or chloroform as soothing agents.

As he was quite satisfied that his glasses were correct and as no change made any improvement in his vision he was given a lotion containing belladonna and rose-water and in the course of a short time his symptoms passed away.

There was probably some hysterical element in the case.

FUNCTIONAL HEMIOPIA

CASE 7.—W. R., age 25, was seen in Dec., 1898, on account of symptoms of asthenopia and glasses were ordered which gave full vision with each eye. He was a high-strung, nervous youth, very thin and anxious. He came again in Nov., 1903, stating that he had suddenly lost the sight of the right eye. The defect was brought to his notice only a few hours before by the fact that, in jumping onto a tram which was in motion, he misjudged his distance and fell on the street. As he was much surprised at this, he at once tried the eyes separately and found that he could hardly see with the right. He could see a little below the horizontal level but nothing above it.

Examination by the perimeter proved conclusively the accuracy of his observation for he could only see with a sector shaped part of the field below. Ophthalmoscopic examination of the eye showed that there was absolutely no fundus change. The general state was a little "below par" and there was no history of preceding illness.

The diagnosis was "functional defect" and a good prognosis was given. Treatment by small doses of bromide of potassium was followed by complete restoration of vision in a fortnight.

BLINDNESS OF ONE EYE UNDISCOVERED FOR FORTY YEARS

CASE 8.—Miss C., age 40, came in Dec., 1904, complaining of weakness of the left eye. She had been reading a great amount to an invalid relative of late and thought that she had "strained" her eyes. The vision of the left eye was taken first and was found to be $\frac{5}{8}$. The obturator was then placed before the left eye and she was asked to read with the right eye but said "if you take that thing from in front of it I will be able to read." It was then discovered that the right eye could only see fingers at two feet. She was greatly shocked and assured me that she had not the slightest idea that there was anything the matter with that eye. O.E.R. There is no change in the fundus to account for the defect, the refraction is hypermet. astigmat. +2D. O. E. L. No fundus change, refraction +.5D astig. Correction of the errors gave no improvement with the right eye but $\frac{4}{8}$ with the left.

It was considered that the defect of the right eye was the result of amblyopia ex anopsia and exercises were ordered. After a month the right eye, with its correction, could see $\frac{5}{17}$.

Unfortunately she had to leave the district soon after this and was not seen again.

MYOPIA, DISLOCATION OF LENS. SPONTANEOUS RECOVERY

CASE 9.—Mrs. D., age 55, seen first in May, 1896, complaining of pain in the left eye and flashing of lights before the eye. Both eyes had been very weak for many years and she had used concave glasses for distance for a long time. About three years ago the left eye began to be irritable and three weeks ago pain and photopsia became manifest. The vision of this eye was completely altered and was liable to sudden obscurations. Whereas formerly she could see nothing at a distance now she could see well.

On examination it was found that the right eye was highly myopic, about 25D; there was evidence of past chorioiditis and the lens was luxated downward for 1 mm. or so. V.R. unaided, hand movements only. V.R. aided by $-20D$, $\frac{5}{17}$.

The left eye was quite different. The iris was tremulous, the lens was completely dislocated downward and lay on the retina at the lower part, and was freely movable. When the eye was quickly rotated upward the lens rose and stood for a time opposite the pupil and then slowly subsided into its former position. When this was done there was a subjective sensation of light. There was some little opacity in the vitreous and the tension was slightly elevated. The vision was $\frac{5}{17}$ and no glass improved it. Rest was advised.

The patient was seen at intervals for eleven years and it was found that the lens in the left eye became fixed and gave rise to no further disturbance. There were no attacks of pain and no photopsia. The vision remained good and no sign of irritation followed use of a $+7D$ lens for reading. The right eye slowly became weaker and the lens became still more dislocated but never quite free.

The specially interesting point in this case is the fixation of the lens without having any bad effect in an eye which was already weak owing to chorioidal degeneration. Had this not been the case

an attempt would have been made to extract it. Taking everything into consideration it is probable that the advice given was the best.

HIGH COMPOUND MYOPIA ASTIGMATISM

CASE 10.—A. C., age 25, came in Oct., 1901, not because he considered that his sight was defective, but because he was sent by his fiancée, whom he had frequently passed in the street. He was quite satisfied that there was nothing wrong with his eyes.

He could count fingers at two feet with the right eye and at three feet with the left eye. There was high compound myopic astigmatism in each eye for which correction was ordered—

R. — 20D, sph. \odot — 7DCy. ax. H. giving V. $\frac{1}{16}$

L. — 20D, sph. \odot — 4DCy. ax. 180 giving V. $\frac{1}{16}$

These glasses were worn for three months and gave perfect comfort and visual acuity as above, and when last heard of he was still quite pleased.

KERATOCONUS, HIGH ASTIGMATISM CORRECTION

CASE 11.—R. G., age 36, was seen in May, 1905, suffering from dim vision. He had worn glasses for the past eight years, increased in strength twice, the last time being one year ago, viz.,

R. $\mathbb{L} + 5.5D, Cy. ax. H. = \frac{1}{16}$

L. $\mathbb{L} + 4.5D, Cy. ax. H. = \frac{1}{16}$

Ophthalmoscopic examination showed mixed astigmatism of very high amount.

Rt. $\begin{array}{c} -8 \\ + \\ +6 \end{array}$ Lt. $\begin{array}{c} +2 \\ + \\ +6 \end{array}$

The condition was evidently a very unusual one and as the cornea was distinctly prominent, was regarded as keratoconus in an early stage. Enquiry into the family history revealed the fact that three members were affected similarly but to a higher degree than this one. The mother, an aunt and a sister all having a condition called by two ophthalmic surgeons "conical cornea," the opinion expressed to this patient was somewhat corroborated.

An attempt to correct the refraction error gave this result.

R. + 7D, Cy. ax. 170 \circ — 2.5D, Cy. ax. 80. gave V. = $\frac{1}{16}$
 L. + 7D, Cy. ax. 175 \circ — 1.25D, Sph. gave V. = $\frac{1}{16}$

These glasses have now been in use for two years and give perfect comfort and V. $\frac{1}{8}$.

RECURRING INTRAOCULAR HEMORRHAGE AFTER WORRY

CASE 12.—J. F., age 30, was first seen in Feb., 1896, on account of myopic astigmatism and was ordered glasses. The right eye was defective owing to an injury received five years before, and there was a cloudy opacity, probably the remains of blood-clot, in the vitreous. The corrected vision of this eye was $\frac{1}{8}$.

In 1906 he was seen again on account of increase of the defect of vision of the right eye. There was no history of injury or general disease but the patient had been much worried in business. It was found that there had been a recurrence of the hemorrhage in the vitreous of the right eye and the vision was now reduced to $\frac{1}{16}$.

He was ordered suitable treatment and rest for a time and was seen again a year later when the vision was $\frac{1}{16}$.

Dermatology

RHINOSCLEROMA

BY WILLIAM S. GOTTHEIL, M.D.

Adjunct Professor of Dermatology, New York Post-Graduate Medical School;
Dermatologist to the City Hospital and Lebanon Hospital; Consulting
Dermatologist to Beth-Israel and Washington Heights
Hospitals, New York City

RHINOSCLEROMA, though a rare disease, is so striking in its appearance and so uniform in its morphology and course, that it is surprising to find that only in recent years has it been recognized as a disease entity. When the elder Hebra in 1870 described his first case, he regarded the lesion, from its hardness and insensitiveness, as a chancre; but its persistency and unchangeableness, save in the direction of a slow and steady growth, the non-appearance of other symptoms of syphilis, and the total inefficacy of antiluetic treatment, soon made him change his opinion. A little later Kaposi made a histological study of a case, found that the tumor was a granuloma, and classed it amongst the sarcomata. Mikulicz in 1876 discovered in the rhinoscleromatous tissues the peculiar cells that bear his name. It was reserved for Frisch, however, in 1892, to discover the rhinoscleroma bacillus, an organism hardly distinguishable from the ordinary pneumococcus, and which is now generally recognized as the etiological factor in the disease.

Since the time of these original investigations the number of recorded cases has grown fairly rapidly; Wolkowitsch in 1899 collected 83; but the numerical statistics of later observers are all subject to the criticism that in a disease of such extreme chronicity and severity a patient will not infrequently in the course of time come under the observation of several observers, and be recorded more than once. It is safe to assume that the total number of cases does not exceed 200.

The geographical distribution of the affection is interesting; it may almost be said to be endemic in certain parts of the world and unknown in others. Most of the cases have been observed in the eastern portions of Europe, more especially in the Danubian regions. Southeastern Russia, Egypt, and Italy have furnished the majority of them; some few have been seen in Switzerland, Spain, Belgium, and other countries. Even in the dermatological service of the Hospital Saint Louis in Paris, perhaps the largest in the world, Cornil and Babés stated in 1890 that there had never been a case. Lenox Brown in his text-book mentions but three cases as having been seen in England, and all these were in foreigners. The same is true of two out of the three cases that I have seen here; the patients were Russians, and acquired the malady in Europe. The third case was also in a Russian; but the patient had been many years in America, and, so far as the history shows, developed the disease here.

As regards sex, the malady has been found more frequently in females than in males; all the cases that I have seen were in women. I know of no case in which the malady began in childhood; it always appears in the third decennium or later. A noticeable fact, and one that has been commented on by other observers, is that all the cases have occurred in the poorer classes, among patients living under bad conditions and exposed to privations of various sorts.

Another point of interest is the seat of the affection, or rather the point at which it originates. Hebra and Kaposi's first cases apparently involved the skin of the external nares and the upper lip alone, and these investigators regarded the affection as a dermatosis pure and simple. Later experience has shown, however, that whilst almost all cases have affected the upper air-passages, and the anterior nares and upper lip have been almost always involved, other neighboring structures have not only been frequently affected but have been in many cases the site of origin of the disease process. The nose, the pharynx, and the larynx, in the order named, are its commonest primary seats; the trachea, tongue, and lachrymal passages, if affected at all, are usually involved secondarily. Yet Pick has seen a case beginning at the lachrymal duct and involving the right lower eyelid; and Potiquet

records a primitive invasion of the lobe of the ear under the name of oto-scleroma. In the cases recorded by Wolkowitsch the various regions were involved in the following proportions of the cases: nasal fossæ, 95 per cent.; exterior of the nose, 90 per cent.; pharynx, 67 per cent.; upper lip, 54 per cent.; larynx, 22 per cent.; palatine vault and velum, 20 per cent.; upper alveolar process, 19 per cent.; trachea, 6 per cent.; lachrymal sac, 6 per cent.; tongue, 5 per cent.; lower lip, 2 per cent.; ear, 1 per cent. It is very evident, therefore, that the malady interests the laryngologist and the rhinologist almost as much as the dermatologist.

The disease picture presented by a well-developed case of rhinoscleroma is so characteristic and unique that there is never the least difficulty in recognizing it. Even an early case, though I have never seen one, would probably be readily diagnosed if the new growth affected the nose, lip, tongue, or other accessible part primarily. The case is different, however, when the affection begins in the larynx, palate, trachea, or other less visible region. These latter cases have all been in more or less advanced stages when recognized and described. The subjective symptoms that the affection occasions are slight; and some of the cases have been accidentally discovered when the patient has consulted the physician for other things.

One or more hard, insensitive, smooth or nodular plaques appear deep in the skin or mucous membrane of the region affected, and very slowly increase in size. These plaques are sharply circumscribed, feel like imbedded masses of cartilage, and save for the accidental inconveniences due to their location, give the patient no trouble at all. The covering skin, at first normal, finally undergoes change; it assumes a peculiar brownish glistening hue; crusts and scales occur; and dilated and tortuous blood vessels appear on the surface. When the tumors develop under the mucosa this latter remains long unchanged; the scleromatous mass looks dark through the transparent covering.

In the course of time, as the ivory-like tumor masses grow certain changes occur from the increase of the growth and its partial involution. These are never, save when accidental injury or infection has occurred, of an inflammatory nature. The tumors grow into irregular or lobulated masses; and superficial erosions may

occur from mechanical causes. As the involution process begins in the centre of the mass gradual shrinkage occurs; the tumors diminish in size, and flatten out; and there is ultimately left a cicatricial mass of ivory hardness in which all the tissues of the part are inextricably matted together.

The appearance of these lesions, and the subjective difficulties they occasion, depend of course on their location and extent. When the nose is affected the nostrils are thickened and stiffened, the tip enlarged and projected, and the appearance of the face is entirely changed. Inside the nose the infiltration causes a gradual stenosis, which may become complete, and cause the patient great inconvenience. The lips may be enlarged and pushed forward, and the deformity may become so great that speaking is much interfered with. In the mouth the velum may disappear and the soft palate shrink up; and the entire vault of the palate may be deformed by cicatricial bands. The larynx, when involved, becomes more or less stenosed by the growing tumor masses. When the gums are affected the teeth are very liable to fall out.

The functional disturbances depend also on the location of the infiltration. The occlusion of the nasal passages leads to the usual disturbances incidental to forced mouth breathing. Invasion of the pharynx makes deglutition painful; and the tendency to contraction of the isthmus in the face of the necessity of keeping it patent may lead to very painful erosions and ulcerations. The deformity caused by the nasal and labial tumor masses may be very great; and when the upper lip is also involved the entire nose is tilted upward and forward. When the larynx, trachea or bronchi are affected the voice becomes changed and harsh, and an amount of dyspnoea may be occasioned that in some cases has proved fatal. Affection of the tongue leads to interference with speech and deglutition. In the region of the lachrymal duct ectropion and persistent lachrymation may occur.

The course of the disease is excessively slow. One of the cases whose histories I append had suffered for at least 15 years; the other had had the disease for 6 years. Koehler has reported a case that had it for 27 years. In the regions covered with mucosa retrogression goes on with fair rapidity; but in the skin the process may last apparently unchanged for many years. Inflammation,

breaking down, and ulceration do not occur; neither is there ever any glandular involvement.

It is generally agreed to-day that the rhinoscleromatous tumors are the mark of a chronic inflammatory process occasioned by the presence and growth in the tissues of the rhinoscleroma bacillus. It is true that inoculation experiments on the lower animals have almost invariably failed, and that the organism of Frisch is morphologically hardly distinguishable from the pneumococcus and other encapsulated organisms. But its constant presence in practically pure culture in the tumors, and its especial abundance in the characteristic "Mikulicz" cells to be described below, has led to its acceptance as the etiological factor in the disease.

The tumor itself in its earlier stages is composed of a dense mass of granulation cells, many of which have undergone the peculiar "ballooning" that Mikulicz first described. In these balloon cells are found most of the characteristic bacilli; according to many observers these are their only seat. In the later atrophic stages the tumors are composed of dense masses of fibrous tissue, in which all traces of the normal structures and appendages of the skin and mucosa are lost.

Of the treatment of the affection little that is satisfactory can be said. Every method proposed has been an entire failure so far as cure is concerned; and even palliative procedures have had but small measure of success. Radical operation, removal of the nose or lip with subsequent plastic procedures is suitable, of course, only for certain cases, and has always been followed by relapse. Treatment with mercury and iodides, regarded at one time as hopeful, has given no results. The same may be said of the anti-mycotic treatment, the inunction of 1 per cent. corrosive sublimate ointment (Doutrelepont), parenchymatous injections of 1 per cent. aqueous salicylic acid solutions, or arsenic, or osmic acid, or the internal employment of the salicylate of sodium as recommended by Lang. The palliative measures directed to removing the more disfiguring nodules or excrescences, relieving the nasal and laryngeal stenosis by dilators, etc., have proved of very temporary efficacy. It is to recommend a palliative treatment of another kind, which has proved efficacious in other hands as well as my own, that this thesis is written. I append the histories and pictures

FIG. 1.



Rhinoscleroma in advanced stage. Photograph of Case No. I.

of the two cases of the disease that have been under my care. The account of the first one will be very brief, since the patient had had the disease, which was in its final stages, for many years, and she would not submit to treatment. The second case has been under my care for over three years, and has been subjected to the successful palliative treatment to be described.

CASE 1.—M. M., Russian female, aged 70, entered my service at Lebanon Hospital in the winter of 1900-01 suffering from a lesion of the upper lip, base of the nose, upper gum, and tongue, that she had had for many years. She had been much worse, the history stated, in the past. Her condition was that of the late atrophic stage of a circumscribed rhinoscleroma. What was left of the upper lip was the seat of a tumorous infiltration of ivory-like hardness, covered with a bluish and more or less telangiectatic skin, and entirely insensitive. The indurated mass occupied both sides of the lip, and extended into the tissues of the cheek; but the centre of the lip was entirely absent, the contraction of the rhinoscleromatous tissues having caused a complete separation of the two halves of the lip. In the middle of the hiatus was a small ulcerated area; and this part of the lip, the patient stated, had always been the chief seat of her trouble. The alveolar area of the upper jaw was infiltrated with the same dense cartilaginous mass; but the roof of the mouth and the floor of the nostrils were but little affected, and there was but slight projection of the nasal tip. The anterior half of the tongue was moderately enlarged, and contained a medium-sized scleromatous mass. None of the deeper organs were involved, and the patient was otherwise a healthy old woman. Under the circumstances, and especially in view of her advanced age, I could not consider her wrong, when after a short stay in the hospital, she decided to have nothing further done, and left the institution.

CASE II.—Mrs. R. H., aged 29, Russian, was sent to me by Dr. J. Frankel of this city on July 17th, 1905. The tumor had first been noticed, she stated, four years before, beginning at the anterior nares, and gradually spreading into the mouth. During the first year, also, she had some undefined throat trouble, for which she had been treated by several practitioners. In 1902 the swelling, broadening, and protrusion of the nose became more marked; and

nasal obstruction and soreness in the throat began to give her trouble. Since that time increase in size of the growth has been steady, though slow. The condition of her throat has been such as to interfere seriously with deglutition; and the complete stenosis of the nasal passages has caused great discomfort. Her general health had been good, though she had lost flesh lately, could not eat much, and had lost much sleep from the condition of her nose. She had several healthy children, and was, when first seen, nursing a three months infant.

There were two large tumor masses occupying the external and lower borders of the external nares, the columella, and the palate bone, causing marked projection of the lower lip, and great dislocation upward of the entire nose. From the anterior nares, and confluent at the columella, project two large oval rounded tumors, with the skin adherent over them, dark reddish-purple in color, and streaked with dilated superficial vessels. All the masses were of a stony or ivory hardness, and entirely insensitive. The deformity caused by these anterior tumor masses was very marked, and is well shown in the accompanying photoprints.

The intranasal growths were directly continuous with an infiltration of similar consistency involving the entire central part of the superior maxilla, the bony and soft palate, the floor of the nose, and the lower turbinated bones, and causing the marked deformity. The nasal passages were almost completely stenosed; it was only with great difficulty that a very fine probe was passed through them, and a brisk hemorrhage followed the manipulation. Posterior rhinoscopy showed the hard tumor masses projecting into the pharyngeal cavity. The entire palate was infiltrated and deformed, the uvula gone, and the velum shrivelled up. The pillars of the fauces and the posterior pharyngeal wall was infiltrated and cicatricial; hard bands extended from the back and sides of the pharynx onto the tongue; and the entire isthmus was narrowed and deformed, and in places exulcerated; so that the patient's story of her difficulties in deglutition and respiration was confirmed. The larynx and the tongue were not involved.

Although, so far as I could ascertain, no diagnosis of the condition had been made by the patient's previous medical attendants, she had been subjected to a good deal of persistent treatment of

FIG. 2.



Rhinoscleroma, photograph of Case II.

FIG. 3.



Rhinoscleroma, photograph of Case II.

various kinds, including arsenic, antiluetic medication, and parenchymatous injections of unknown nature. In view of the hopelessness of casual medication of any kind, I confined my efforts to an amelioration of the symptoms. Her main difficulty at the time being the nasal stenosis, I attempted systematic dilatation, using the smallest sizes of the old-fashioned hard rubber uterine dilators for the purpose. In spite, however, of the utmost care and delicacy in the manipulations, violent hemorrhage was always set up, which sometimes became almost uncontrollable. On one occasion she had to remain in the office with the anterior nares and the upper pharynx tightly plugged for four hours before I could send her home. This is not a feature usual in these growths, and undoubtedly pointed to the presence of some degree of hemorrhagic diathesis in this case. It caused me to give up all attempts at instrumental dilatation; and rendered all hope of relief by any operative procedure very faint. I therefore confined myself to the use of topical remedies for the amelioration of her nasal and pharyngeal symptoms.

Finally, not knowing what to do for the patient, I turned, as so many of us do in similar cases, to the X-ray. There had been a case or two reported in foreign journals where benefit had been claimed to have been derived from its use. I was by no means an enthusiast for the procedure, for I had had but too much reason to doubt the extravagant claims for this therapeutic agent made by its enthusiastic advocates; so I promised the patient nothing. This treatment was not carried out with any thoroughness at all, through the patient's fault. She stayed away for weeks at a time, came very irregularly, and invariably stopped treatment as soon as she felt a little better. From October 30th, 1905, to December, 1908, she had only 35 sessions, an ordinary tube with tin-foil protection being employed, and the anterior nasal tumors only being treated. Every three or four sessions, especially when she was fairly regular in attendance, there would be a mild but well-marked reaction; treatment would then be suspended for a week or so, until the inflammation subsided. To my surprise and gratification there ensued a marked change in the external tumors. They diminished greatly in size, to about one half of what they were at first. The projection of the nose diminished to a considerable extent, and both the patient

and her friends noticed the growing return to her normal cast of countenance.

I then had two of the so-called Cornell safety tubes constructed, with long beaks, one of one inch diameter for the pharynx, and another one-quarter of an inch across for the nares. These have been used from time to time during the past year; but the patient has not given me an opportunity for proper trial of the remedy, and the results attained have not been marked. I think I can say that the scleromatous process has been held in check; the patient's discomfort and disabilities have grown somewhat less; the growths have not increased in the last 18 months as they naturally would in that time, and as they did before; and the pharyngeal ulcerations have certainly improved. I finally made up my mind that, in spite of the danger of hemorrhage, operative division of the cicatricial bands that deformed and constricted the palatal isthmus was indicated, especially as it was impossible to apply the radiotherapy with any degree of effectiveness. This advice the patient was not inclined to accept, and for the last few months I have not seen her.

Since the time that the first reports of good results in these cases of rhinoscleroma from the use of the X-ray appeared, there have been several confirmatory reports, both abroad and in this country. I am inclined, therefore, to add this disease to the small list of affections in which treatment by radiotherapy is indicated. So far as I know, nothing approaching a cure has ever been effected: but a number of patients have been markedly improved. And since rhinoscleroma is a serious affection, leading to deformity, discomfort, disability, and even danger, and since no other mode of treatment ever proposed has given results, I advocate treatment with the X-ray as the best and most promising at our disposal.

Orthopædics

CONGENITAL SCOLIOSIS. REPORT OF A CASE SHOWING SUPERNUMERARY RIBS AND VERTEBRÆ AND OTHER DEFORMITIES, WITH RADIOGRAMS

BY H. HUDSON, M.D.

THE subject of this report is a boy about six years old, of American parentage, the eldest of three children. One brother of three years and a sister of eleven months are both apparently well-formed and of sturdy physique. Both the father and mother are living and well and of normal build. The only history of deformity in the family is that of a paternal grand-uncle, who, they have been told, was a hunch-back. The boy has always been well and strong except for certain infectious diseases of childhood, measles, whooping-cough and chicken-pox. His birth was normal with spontaneous delivery. The general examination at present shows a boy, perhaps a bit undersized for his age, but sturdily built, active and, except for the deformity, not to be differentiated from the average lad of six.

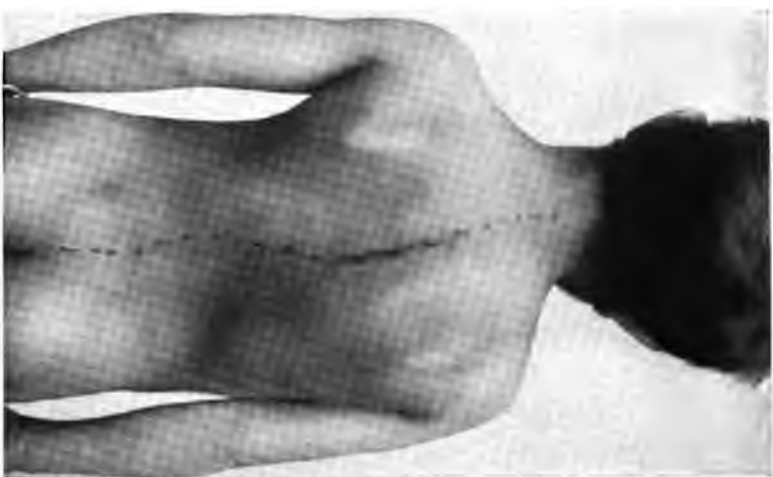
The attention of the parents was first drawn to the fact of the boy's not having a normal back, when he was about nine months old. At this time it was noticed that when the child was in the sitting posture, one shoulder was higher than the other, but, as they attributed this to "weakness of the back" due to the age of the child, they did not seek the advice of their physician until a month or two later. They then consulted Dr. W. W. Funk, who referred the case to the orthopædic department of Jefferson Hospital, where corrective appliances were prescribed. Since then the braces have been worn continuously, and within the last year, to preserve the mobility of the spine, he has been under instruction, in the department, in general exercises, the list of normal movements being those he has been taught. At about this time also, with the hope of correcting all factors that might interfere with

improvement, he was referred to the eye department and at present is wearing glasses for some slight ocular defect.

On regional examination there was found a marked right dorsal curve with a left lumbar curve and also a left cervical deviation and considerable rotation. On anterior, posterior and lateral flexion, it was very noticeable that there was very slight if any impairment of flexibility; as a matter of fact the patient could assume with ease a degree of flexion that many normal children could only reach with difficulty. In the standing posture the elevation of the right shoulder and scapula would possibly approximate an inch and a half or two inches higher than the left. The effect of the inequality was heightened by a torticollis, the head being tilted strongly to the right. At about the sacrococcygeal articulation there was a rather deep dimple. On examination we found that the coccyx was deficient and terminated in a broad process (Figs. 1 and 2). There was marked bulging of the ribs, most prominently at the level of the apex of the dorsal curve, on the right posteriorly and on the left anteriorly. The anteroposterior and the lateral curve with the anterior and posterior bulging of the ribs, with the child in the recumbent posture, is shown by the tracings, and comparing these with the radiographs we gain some slight idea of the mobility of the vertebræ, as the tracings show a marked diminution, especially of the lumbar curve (Fig. 3). The tracings were obtained by measuring the distance from a given line, of certain points an inch apart on the spine, by means of an apparatus which I have devised and will describe later. The accompanying radiograms were taken by Dr. Willis F. Manges, Skiagraphist to Jefferson Medical Hospital. The analysis of these will show us the following malformations and deficiencies: (See Figs. 4 and 5.)

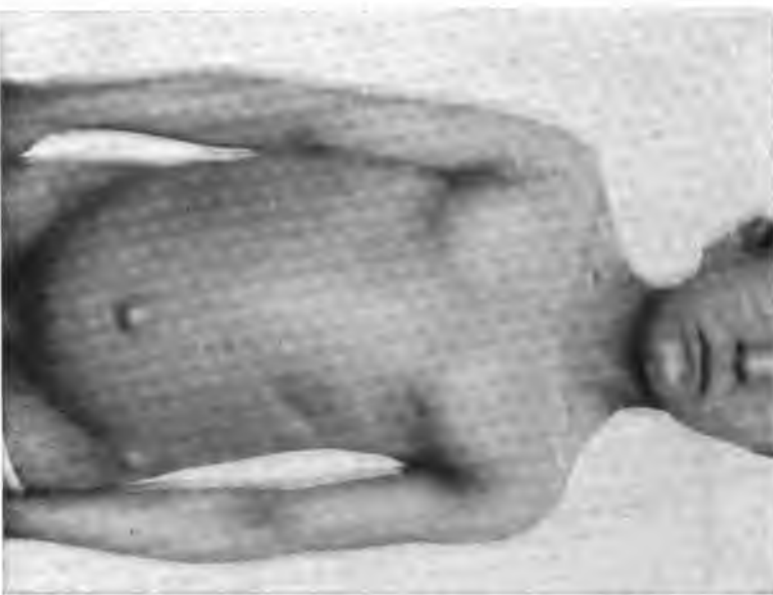
- a.—6th and 7th cervical vertebræ are cleft.
- b.—3rd and 6th dorsal vertebræ are cleft.
- c.—Rudimentary half vertebra inserted between the right outer edges of the 9th and 10th dorsal.
- d.—10th dorsal is cleft and markedly wedge-shape. This vertebra and the supernumerary half vertebra articulating with it, apparently account for very nearly all the left lateral deviation, as the planes of the other vertebræ are practically parallel.

Fig. 1.



Photographs showing contour of spine and tilting of head with elevation of right shoulder. The cleft or dimple over coccyx is plainly shown.

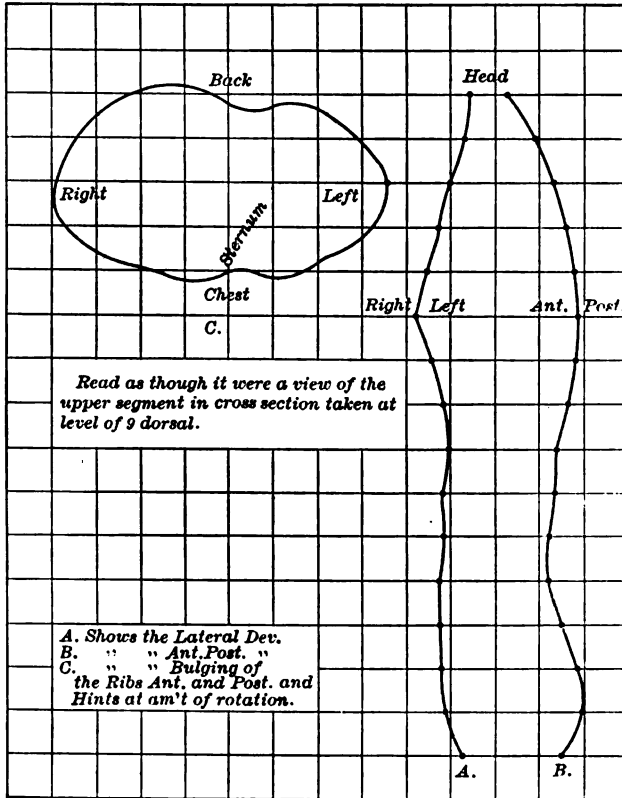
Fig. 2.



Showing inclination of body, with no asymmetry of face following torticollis.

e.—There are six lumbar vertebræ, with the sixth apparently wedged to the right by a large transverse process articulating with or bearing on the ilium, and apparently some difference in the sacro-iliac junction as compared with the opposite side.

FIG. 8.



Line A. is in reversed position but still gives us the value of the deviations of the line of the spine.

The alterations of the ribs are:

f.—Double cervical ribs articulating with the 7th cervical vertebra.

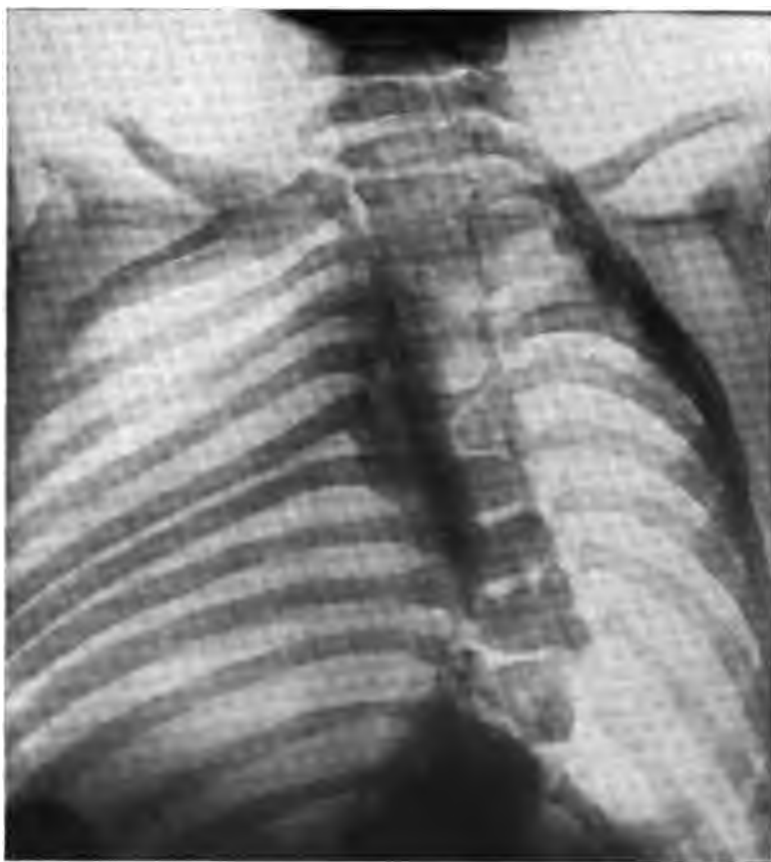
g.—The ribs articulating with the fifth and sixth dorsal on the left appear to be joined together by a band from one articular head to the other and the heads seem to be imperfectly developed.

h.—Articulating with the rudimentary half vertebra is a fully-developed rib,

In this case then is found not only an abnormality in form, but a decided numerical variation also, for a count of the thoracic spine shows thirteen vertebræ, besides the rudimentary half vertebra; and of the lumbar spine, six vertebræ. While on the left side we can count thirteen ribs, on the right fourteen can be made out. It is curious that the lumbar curve, while apparently compensatory in action, is not due alone to the effort on the part of the organism to preserve the balance, but is part of the anomaly in that it is also due, primarily, to a deformity.

Bernard Roth says, in his work upon lateral curvature of the spine which was published in 1899, "Some anomalous cases of lateral curvature may be directly due to congenital malformation of the individual vertebra and although, up to the present time, such cases have not yet been diagnosed in the living patient, it is quite possible they will be recognized in future by means of further improvement in X-ray photography." Eight years later in 1907 Lovett makes answer to this prophesy and says, "Scoliosis due to congenital defects was formerly thought to be a decidedly rare affection. In the last few years it has been recognized that it is much more common than was supposed and a steadily increasing number of cases are referred to a congenital origin, a change largely due to the use of the X-ray and the more accurate study of the spine thus made possible." It is a wise procedure to utilize in the study of scoliosis, for the intimate knowledge of the spinal structure thus obtainable, X-ray photography; especially in our study of those cases in early life, it is a procedure of much importance, and the principle should be adhered to as closely as in the study of fractures. In early life in the normal individual the tendency is towards the resistance of deformity and where deformity is inevitable there is a power of adaptation which diminishes with the attainment of maturity. In the young child of ordinary physique, barring rickets and other acquired conditions, there is not the excuse for deformities that attain in later years, hence it behooves one in the study, especially of spinal curvature, of the young subject, and in view of the observations of Lovett, quoted above, "that an increasingly large number of these cases are referred to a congenital origin," to keep this fact constantly in mind and to

FIG. 4.



Radiogram taken by Dr. Willis F. Manges, showing alterations in thoracic and cervical regions. The last two ribs on right and one on left not included in this picture.

Fig. 1.



Radiogram taken by Dr. Willis F. Manges, showing alterations in lumbar and sacral regions.

make use of every means in his power to become thoroughly acquainted with the condition.

Scoliosis due to congenital defects of the skeleton may be classified under two headings: 1. Those cases due to causes interfering with symmetrical development of the muscular structure or with the equilibrium of the skeleton,—these cases may be more appropriately referred to as “scoliosis due to a congenital origin.” 2. The remaining type of deformity might be referred to as “congenital scoliosis of essential type,” and is that class in which the curvature itself is part of the anomaly, has nothing to do with balance, and is entirely independent of muscular development as the cause. Scoliosis may occur as a congenital condition in connection with severe malformations such as rhachischisis and the like and in connection with foetal rickets and paralysis. It occurs also as the result of less severe spinal defects, such as cervical ribs, spina bifida (rhachischisis partialis) and abnormal formation of the last lumbar vertebra.

Congenital scoliosis may be evident,—

1. Immediately after birth, as in the case of severest malformations. Colville in one thousand and fifteen new-born children found only one case of scoliosis. Whitman mentions two cases seen at three months, one of which was noticed shortly after birth, the other was the subject of contracted tissues on the concave side and was the subject of a lumbar hernia.

2. Or the condition may not be apparent until the child begins to walk, as in the case of malformations not severe enough to cause a curve in the recumbent posture.

From the fact that numerical variations are not infrequently asymmetrical in the spine the conclusion is presented that such defects may cause scoliosis, which does not appear until the beginning of the second decade, on account of the fact that at this time the articular facets undergo a change in character. Bohm has called attention to the fact that numerical variations in the vertebral column apparently play a part in causing a scoliosis really of congenital origin but not necessarily appearing at birth. In the Dwight collection of abnormal spines in the Warren Anatomical Museum there are three that show a scoliosis apparently resulting from the numerical variations. These variations are: 1. A sacro-

lumbar curve to the left with caudal variations and union of the sacrum, one vertebra higher on one side. 2. Dorsal scoliosis with cranial variation and cervical ribs of unequal development. 3. Dorsolumbar scoliosis with cranial variation and fusion of the last three lumbar and first sacral vertebrae with asymmetry of the articular processes between the eighteenth and nineteenth vertebrae. All these scolioses are of comparatively slight degree. Clinically he found from X-ray examination in sixteen out of twenty-four cases of habitual scoliosis, from which rickets and other acquired causes could be excluded, types of the variations present at the primary seat of deformity.

The subject of numerical variations has a distinct bearing on the etiology of scoliosis (Fischl). Numerical variation in the human spine is estimated by Bardeen as occurring in fifteen or sixteen per cent. of people. The following classification of the abnormal spines in the Dwight collection in the Warren Anatomical Museum will show the more usual forms:

1. The number of presacral vertebrae is normal but there is irregularity at the junction of the dorsal and lumbar or lumbar and sacral regions.

2. On some specimens the twenty-sixth presacral vertebra is the one forming the largest part of the articular surface in contact with the ilium (vertebra fulcralis), while the twenty-fifth is not quite separated from it.

3. There may be more than twenty-four perfectly free presacral vertebrae, the extra one being (a) thoracic, (b) or lumbar, (c) or both thoracic and lumbar, the latter being sacralized on one side, the twenty-seventh becoming the vertebra fulcralis.

4. One or more presacral vertebrae may be imperfectly developed, (a) one or more being fused, (b) the occiput and atlas being fused, or (c and d) the twenty-fourth being more or less sacralized.

5. There may be lacking one presacral vertebra, (a) in the lumbar region, (b) in the thoracic region, (c) there being twelve pairs of ribs, the first pair being cervical and perfect on one side. The twenty-fourth is the vertebra fulcralis in all these groups.

The two sides of the column may vary independently, a point of much importance. Clinically these variations are described as cervical ribs, lumbar ribs, extra lumbar vertebrae, sacralized ver-

tebræ, deficient vertebræ, etc. When present these variations are usually at the regional boundaries, and are found more frequently toward the posterior end of the spine than anteriorly. The two most common locations of congenital defects are in the cervico-dorsal and lumbar regions. In the former, cervical ribs are a frequent accompaniment. The formation of a cervical rib is often associated with a splitting of the vertebral bodies, as shown by the X-ray and in some cases the cervical rib is accompanied by a rudimentary extra vertebral body. The shoulder on the side of the cervical rib is elevated and the curve is a sharp cervicodorsal one with a compensatory opposite curve before. In the lumbar region the curve is frequently associated with spina bifida, spina bifida occulta, or sacralization of one side of the last lumbar vertebra. The error in development having once occurred, there is evident an effort on the part of the organism to correct it as much as possible. If there are but eleven thoracic vertebræ the bodies very often are longer than usual. If the last rib be rudimentary the penultimate is unusually long, if there be an irregularity in the lumbar vertebræ an effort is apparent to imitate the usual aspect of the region as nearly as may be in the spread of the transverse processes. In cases where the last rib is like a transverse process and there are only four lumbar vertebræ the appearance is often very striking.

The thorax may be segmentally reduced or extended at either end, extended at both ends, or extended at one end and reduced at the other, a simultaneous reduction at both ends has been reported. According to Bardeen the original position of the ilium is opposite the anterior part of the lumbar region, and in development it travels downward. When once it has joined a vertebra it never leaves it. The junction of the spine and ilium occurs at about the end of the fifth week. No chondrification has yet occurred, but there is no subsequent change in segmentation. Even at this early period the thoracic vertebræ are differentiated from the others, consequently an increase or decrease in the number of thoracic vertebræ is not necessarily determined by the point at which the ilium stops in its migration tailwards, but presumably depends on an error of segmentation (Dwight, Fischl).

Speaking broadly these variations may be regarded as being

variations (*a*) in a cranial direction, and (*b*) in a caudal direction. In the former all the regional boundaries are placed higher, there being only six cervical vertebræ; in the latter the regional boundaries are lower than normal. The vertebræ at the regional boundaries are called "transitional vertebræ" and have the features of both regions.

Malformation of a part of a vertebra, such as one of the epiphyses, a process, or a part of the arch, will lead to asymmetrical growth which may disturb mechanical conditions and lead to scoliosis. Abnormal curves in the anteroposterior plane also occur. Congenital elevation of the scapula, Sprengel's deformity, will cause a scoliosis which is usually a high cervicodorsal curve with compensatory dorsolumbar curve. One scapula is occasionally absent or malformed. A peculiarity more frequent in the thoracic and lumbar region than in the cervical and sacral region of the column is the existence of a half vertebra; such specimens have a wedge-shaped half centrum to which are attached a lamina, a transverse superior and inferior articular, and half a spinous process. As a rule a half vertebra is ankylosed to the vertebra above and below.

Occasionally great irregularity characterizes the ribs of one or both sides. Some may be bifurcated while others are deficient. Such irregularities are a cause of scoliosis.

Heredity must also be considered, as it is known that scoliosis is apparently inherited in some families. Schulthess estimates that from ten to fifteen per cent. of scolioses are hereditary. Congenital defects of form can be inherited and would reasonably lead to similar forms of scoliosis, while an inherited weak skeleton or a disposition to rickets would not necessarily lead to a reproduction of the form of scoliosis. There are cases however in which the form seems to be hereditary. However, the present condition as to the meaning of these variations is expressed by Dwight as follows: "The cause of the original error is as yet undetermined, but there is no reason to suppose that it is either hereditary or a step toward the future."

Beside the cases already referred to, it will be of interest, perhaps to cite the analysis of a case described by the celebrated anatomist Rokitsky, the tracing of which, along the following

analysis, will be found in Roth's work, "The Treatment of Lateral Curvature of the Spine."

(a) The 5th and 6th dorsal vertebræ ankylosed and have only one left transverse process between them.

(b) Extra wedge-shaped half vertebra interposed on left side between the 11th and 12th dorsal vertebræ.

(c) Another similar half vertebra on same side between the 1st and 2nd lumbar vertebræ.

Roth then remarks in relation to this case, "It can be easily understood how extremely difficult it would have been to have diagnosed the real cause of this case of congenital lateral curvature in the living patient."

In conclusion it is but just to draw attention to the references and to state that the writer is especially indebted to the work of Lovett, "Lateral Curvatures of the Spine and Round Shoulders," and that of Bernard Roth, "The Treatment of Lateral Curvature of the Spine," not only for a large part of the subject-matter of this paper, but for the majority of the references also. It is to be stated, that in the effort to prevent distortion of meaning, the references have been set down, as far as possible, in the exact words of the writer.

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Pediatrics

MARASMUS; INHERITED SYPHILIS; SUBACUTE BRONCHITIS *

BY RICHARD B. GILBERT, M.D.

Professor of Diseases of Children in the University of Louisville Medical Department, Louisville, Kentucky

GENTLEMEN:—As is usual in the children's clinic, we have more material on hand this morning than we can possibly utilize for one lecture; therefore I will select those cases which I believe will be of the greatest interest and of the most advantage to you as illustrating certain types of disease with which you will come in contact when you leave this institution to engage in the practice of medicine. One of the patients I will show you has been here previously, the others come to the clinic this morning for the first time, and we are expected to arrive at the diagnosis and suggest proper methods of treatment.

CASE I.—This little girl, three years of age, you will remember was before you last week. The diagnosis of marasmus had already been made, but after further investigation we concluded that the marasmatic condition was due to a subacute infection, possibly an ulceration, in the lower end of the colon, probably the sigmoid flexure. She had been for some time having dysenteric stools, not every stool dysenteric,—but every day or two she passed feces streaked with blood, and diarrhoea had been more or less constant for months.

You will recall that this baby was greatly emaciated, peevish and fretful, when previously before us, that she cried almost constantly. We washed her lower bowel thoroughly with saline solution, and we will repeat that procedure to-day. This treatment

* Clinical Lecture delivered at the University of Louisville Medical Department.

ought to be carried out two or three times a week. You observe that the child is still very thin, but she appears much better than when before us last week. The mother reports that the baby has cried very little during the week just passed, that her appetite has improved, that she no longer passes blood, and the stools have assumed a more normal appearance. You will notice the enlarged lymphatic glands in both inguinal regions, also a few small nodules under the skin of the abdomen, to which your attention was previously called.

There is one anatomical peculiarity presented by this child which I believe was not mentioned in our previous lecture, viz.: there is a tendency to the so-called *caput Medusæ*. This is a condition, as you are all probably aware, due to slight enlargement of the cutaneous veins in the region about the umbilicus. From your anatomical studies you will recall that the external epigastric vein extends as high as the umbilicus, and that it joins the femoral vein at the saphenous opening. Oftentimes around the umbilicus there is a tendency to aggregation of the ramifications of these blood vessels forming what is known as the *caput Medusæ*, thought to be due to some interference with circulation of blood through the liver. In this case it is probably explained by the existing marasmatic condition, there is a sluggish circulation everywhere throughout the body. You will remember that there is free anastomosis of the veins of the abdomen, that one set of these veins runs upward along the line of the suspensory ligament of the liver where two folds of the peritoneum double upon themselves at the site of the umbilicus in *fœtal* life, that some of the superficial veins extend along this curve between the walls of the abdomen and empty into the portal circulation, and that enlargement of the liver and lymphatic glandular nodules may seriously interfere with the return current producing a decided stasis of the plexus of veins around the umbilicus. Of course this has no particular reference to the case before us excepting as a matter of explanation.

We will proceed to repeat the treatment we gave this child last week, i.e., thorough irrigation of the colon with normal saline solution. And I want to emphasize the statement made when this patient was previously before you, that this is a little operation the doctor ought to perform himself and not entrust to the nurse. We

have half a gallon of sterile water, and we will add to this a heaping teaspoonful of common salt for every pint of water, which will practically make half a gallon of normal saline solution. We will again disinfect as much of the bowel as we are able to reach. If this little operation is properly done there is no danger whatever of doing the child injury. We introduce the nozzle of the syringe within the rectum and then wait until the rectal pouch is flooded with water before carrying the instrument further up. We use a soft catheter so that no harm can be done. I am quite sure the diagnosis that we made last week is correct, that this is a subacute colitis, or a sigmoiditis, and modification of the diet will do as much toward bringing about a cure as could be done with medicine.

Instead of the strongly acid odor which was apparent the other day, we have now an odor of sulphuretted hydrogen, the normal fecal odor; still some small particles of undigested food are coming away with the water, as will be readily observed. We have introduced the catheter the full length, and the warm salt water passing over the irritated mucous membrane of the bowel causes a sense of comfort to the patient and soothes the irritated mucous membrane to such a degree that you will observe she forgets to cry. It is a strange fact that salt water coming in contact with any cutaneous raw surface is exceedingly irritating, but the same substance brought into contact with the mucous membrane, the internal skin, is soothing in its effect. While we find some small particles of partially digested food in the fecal matter which is brought away by our irrigation, there is almost entire absence of the epithelial flakes which were so numerous when we practiced irrigation last week, showing that there has been considerable improvement, that there is decidedly less exfoliation of the epithelial layer of the mucous membrane of the colon and sigmoid flexure. We have now introduced the entire half gallon of salt water, and several ounces of the fluid still remains within the intestine.

The mother tells us that after we washed the bowel of this child last week she slept nearly all day, which illustrates the soothing effect of the application. I think it would be well to prescribe in this case some digestive ferment like diastase. We will therefore give the mother two ounces of liquid taka-diastase and instruct

her to give the child half a teaspoonful after each meal, or each time that she eats whether at meal times or otherwise.

Another thing which suggests itself, and this was casually mentioned in our previous lecture, viz.; the bare possibility that there may be a specific element in this case, is the reason why we recommended mercurial ointment by inunction. In any event the local application of mercury can do no possible harm, and the treatment should therefore be continued.

There is nothing of which I have knowledge that will do more good in this case than the introduction of saline solution into the bowel. She has retained several ounces of the solution in the pockets or loops of the colon, and the lacteals will take this up and transmit it to the blood, it will increase the activity of the liver and especially the kidneys. In thirty minutes after filling the colon with saline solution there will be noted a marked increase in the activity of the kidneys as evidenced by the free secretion of urine. In any chronic or subacute disease if you induce active and free elimination by the kidneys there will always follow more or less benefit, because this process eliminates from the blood waste and effete materials.

This child has markedly improved since we irrigated the colon with salt solution, there is not only a local effect but a decided constitutional effect from this treatment. In the treatment of typhoid fever, either in children or adults, my practice is, instead of giving the patient a laxative, or any other medicine, to give saline solution by rectal injection. A child with typhoid fever needs little other medicine than something to keep the lower portion of the alimentary canal clean, and to stimulate free diuresis. For this purpose I have been in the habit of giving a few drops of dilute muriatic acid, and my rule is to give as many drops as the child is old, one drop for each year. In addition to this, of course, the diet is carefully regulated, avoiding all starchy foods. Where the temperature is very high, showing evidence of acute enteritis, it is well to practice irrigation twice a day, getting rid of the poisonous material as rapidly as possible, and in many cases it is wise to withdraw milk diet absolutely for the time being.

In the case before us the child cannot assimilate milk; I believe she would do better on animal broth than she would on milk.

Typhoid fever, as we know, in children of this age, is very mild in character. During our irrigation to-day you noticed some particles of undigested material coming away with the return fluid. The child has probably been given starchy foods, including potatoes, and to insure digestion of the starch we suggested that she be given small doses of taka-diastase. This is really a wonderful remedy, capable of converting to sugar many times its own weight of starch. It was discovered and isolated by Jochi Takamine, an employe of Parke, Davis & Company, of Detroit, Michigan. He makes this ferment from wheat bran, and it will digest starchy foods better than any other ferment of which I have knowledge. After administration of this preparation for a few days to the child before us, I dare say we will find no more undigested particles of starchy food in the fluid as it returns from irrigating the lower bowel. We have not given this child any drug to arrest the diarrhoea, and we will not do so. As digestion improves there will be less irritation of the sensitive mucous membrane of the bowel, and by getting rid of the offending matter by irrigation we believe improvement will progressively continue.

CASE 2.—Mary F., aged nine years, is brought here for treatment by one of her relatives. The first thing we note in looking at this girl is an extensive stellate radiation around the angles of the mouth. She also has inflammation of the eyes, probably an iritis, which we are told has persisted for two or three years. We also find there is some little induration of the lymphatic glands of the neck. The glands are slightly enlarged, but manipulation elicits no evidence of pain. On examining the child's mouth we observe that the teeth are notched.

CASE 3.—Lillie F., aged seven years, sister to the foregoing patient. Note this child has a peculiar swelling of the fingers of one hand, particularly the little finger, which is larger than the thumb. There is also an eruption on the back of the hand, and a varicose condition of the veins extending upward toward the wrist. She has escaped involvement of the eyes, but we observe that the teeth are notched as in the previous case.

Of course there is absolutely no question whatever about the diagnosis in these two cases, the symptoms are pathognomonic, both these little girls are the victims of inherited syphilis. It is useless

or at least unnecessary for us in cases of this kind to inquire into the family history, the diagnosis is easily made, the symptoms presented cannot well be confounded with any other disease, and we simply have to meet the conditions as we find them.

As to treatment: We shall have nothing to say about the eye involvement, but refer the patient to the ophthalmological clinic. Likewise, in the other case, we will make no comments concerning the enlargement of the fingers, but refer the patient to the surgical clinic. Sometimes it may be advisable to amputate the fingers in such instances, but this is a point for the surgeon to determine. By the administration of alterative remedies we can oftentimes accomplish wonderful results in cases of inherited syphilis, and of course both these girls should have been under treatment long ago. By constitutional treatment alone it is sometimes possible to cause disappearance of all the symptoms, excepting the stellate lines radiating from the mouth which will constitute a permanent deformity, and the enlargement of the fingers may also continue permanently, like the notched teeth.

We will prescribe for these little girls kali iodidi saturated solution in three drop doses well diluted for the first week, four drop doses the second week, five drop doses the third week, to be taken three times a day. We will have them report to us from time to time that we may see how the drug is tolerated, and the amount can be regulated accordingly.

The question has been asked if tuberculosis might not produce enlargement of the fingers such as we observe in this case. We know tuberculosis is not rare in children, and no one can say that it might not produce enlargement of the fingers; but I am inclined to attribute the deformity in this instance to the syphilitic diathesis. Just why syphilis or tuberculosis should manifest itself in such diverse and manifold ways is a question which perhaps the oncoming generation may be able to elucidate; but at this date we do not know why there is such a wide range in the manifestations of these diseases. Take these two cases, for instance, one has an extensive inflammation of the eyes, she can scarcely see well enough to get about safely, she has marked striæ, lines, or scars, radiating from the angles of the mouth; the other child has enlarged fingers of one

hand as the principal manifestation, and yet the symptoms in each case are probably due to the same general dyscrasia.

Some one has asked if larger doses of iodide of potassium than I have mentioned would not be advisable in these cases. In giving this drug to children I am in the habit of starting on three drops three times a day well diluted, then increasing the quantity gradually. I have always considered seven drops three times daily as the maximum dose for children of this age, believing better results could be accomplished with this quantity than by the administration of larger doses. Another reason for giving the drug in medium doses is that we may not disturb the stomach. Children do not tolerate heroic medication with iodide of potassium as do adults.

CASE 4.—The next patient is a little girl aged three years, who is brought to us for treatment by her older sister. We find she is very small for her age, but she has twenty of her deciduous teeth. The history is that this child is troubled with cough each night, which prevents sleep, and there has also been some elevation of temperature. Whenever there is a history of night cough, and especially where the cough is much worse during the night than in the day time, it is always suspicious, and that one statement of the patient leads us to infer that the trouble may be pertussis. This child evidently has a mild subacute bronchitis, about which we will have more to say presently.

The clinical examination of children is oftentimes a difficult matter to accomplish on account of their restlessness and failure to understand just what is expected of them. A child is very much like a horse in many respects. In examining children two or three years of age, if you approach them properly yet firmly you can get control of them and secure their confidence which will enable you to examine them in any way you may desire. We have stripped this little girl to the waist, and you note how quietly she sits on the table, she does not cry nor does she object in any way to our manipulations.

I think we shall be able to make a thorough examination of this child and tell you just what is the matter with her, and in this connection I will give you a few points about the physical examination of children in general. A man who expects to make a diagnosis of pulmonary troubles in the child, and the younger the child the

more difficult it is, by consideration of such symptoms and signs as are usually present in the adult, will be very much disappointed. In the first place, the walls of the chest are a great deal thinner, therefore the transmission of all sounds, either percussion notes, or the sounds by auscultation, are materially modified. In the adult you have the pectoralis major muscle overlying the ribs through which the sounds have to penetrate. Besides this there is always more or less fatty deposit underneath the skin which has to be accounted for.

A method of preliminary preparation, which I have always found instructive and convenient, is to lay the chest off in regions, which may be done, if you wish, with pencil or a piece of chalk. This is a valuable aid to examination, no matter whether the patient be an infant or adult. In an infant or child two or three years of age in ninety-five per cent. of cases, if disease exist, it will be found above the mammary line. In mapping out the different regions of the chest in the infant, it must not be forgotten that during childhood the liver is always correspondingly larger than in the adult. In this case, could we make an autopsy, we would probably find the liver extending upward as far as the sixth rib, consequently in making our percussion we will find the liver dulness markedly increased. On the left side the base of the heart is at least one rib higher up in the child than it is in the adult. As life advances and the patient develops in size the relative position of the heart is modified to the extent of the width of one rib. The base of the heart in this case can be easily made out by auscultation and percussion as high as the upper margin of the second rib instead of the lower margin as in the adult. The heart extends a little further underneath the sternum, and on account of the feeble circulation the heart becomes dilated to a much greater extent than is true in the adult; consequently you will hear a dull sound in that region. Remember that in the child the heart occupies a larger area proportionately than it does in the adult, displacing the lung; the liver on the right side extends almost up to the nipple, and the most important features of pathological conditions existing in the thorax will be found above the mammary line.

When you examine the back of the child there are several things to contend with: You must notice the two triangular spaces cov-

ered by the scapulæ, the spinatus muscle spreading over the bone itself, and the subscapularis muscle attached to the scapula. At the lower segment there is the border of the serratus magnus muscle between your ear and the ribs, so that in order to reach the space near the lungs we must draw the scapulæ well forward, a procedure which markedly widens the inter-scapular area. One cannot gain much information by listening over the scapulæ, for even in the adult an examination is far from satisfactory, and in the child it is still less satisfactory. When the scapulæ are drawn well forward, the inter-scapular area is widened, so that for all practical purposes your examination may be satisfactorily made, you can hear all the sounds abnormal or normal within the chest.

The doctor of to-day has a tendency to drift away from the old-fashioned methods of making a diagnosis. Austin, Flint, Loomis and others twenty-five years ago wrote text books on percussion, auscultation, etc., in physical diagnosis. Doctors in those days were better trained in some respects than we are to-day, and especial attention was devoted to sounds within the thorax, all of which mean something. There are many practitioners of medicine who frankly admit that they are unable to differentiate between many of the sounds that may be heard within the thorax in physical examination.

In the practice of physical diagnosis in children we are aided considerably by auscultation. If we can hear a râle we can usually tell something about what it signifies, even if we can gain little or no information by percussion. If there is consolidation of any portion of the lung tissue we will be able to locate it by the percussion note. The ribs of the infant or child are very elastic, and therefore percussion over these structures gives a different sound from what it does in the adult, where they are composed of solid bone; likewise the cartilages which attach the ribs to the sternum in front are more elastic than in the adult, and the sound obtained by percussion over the sternum is thereby intensified. So you see there are many things which must be taken into consideration in the physical diagnosis of diseases of the chest in infants and children, viz.; difference in the chest walls, elasticity of the ribs, high position of the liver, higher position of the heart, difference in posi-

tion of the arch of the aorta which modifies or increases the area of dulness in this situation, as well as other minor points.

Having made a thorough examination of the little girl before us, we see no reason to change the opinion already expressed, *i.e.*, that she is suffering from a mild subacute bronchitis, for which we will prescribe the following:

R Ammonia bromidigr. xxxv
 Aqua pura,
 Syr. simplicis, aa.....℥i
 M. Sig.—Teaspoonful every two hours.

Pathology

ATYPICAL FORMS OF MALIGNANT RENAL HYPERNEPHROMATA WITH CONSIDERATION OF THEIR CHEMICAL CHARACTERISTICS

BY H. GIDEON WELLS, M.D.

From the Pathological Laboratory of the University of Chicago

OUR ideas concerning renal tumors have changed greatly since the time when Grawitz found so much opposition to, and failure of recognition of, the doctrine of the origin from misplaced embryonal adrenal tissue of those renal tumors that are now classified as hypernephromata, and at the present day there are few pathologists unwilling to admit that the hypernephromata are by far the commonest of the renal tumors. Nevertheless, concerning many of the renal tumors there will not be agreement among different pathologists as to their exact classification, for there are some who refuse to admit that certain forms of renal tumors are hypernephromata, while others will maintain the suprarenal origin of the same tumors. It must be admitted, however, that the boundaries of limitation in these cases are being steadily widened, and more and more of the histologically multiplex forms of renal neoplasms are being interpreted as of this interesting variety.

We are learning little by little that only a relatively small proportion of the hypernephromata show the typical histological picture of cells which in both structure and arrangement proclaim their relation to the suprarenal; often indeed the structure is widely different from this typical character, sometimes approaching in type the sarcomata, sometimes the carcinomata, and not infrequently the malignant papillomata or papillary carcinomata, so that they easily escape recognition if the study of both primary and secondary growths is not sufficiently searching. Having had the fortune to obtain two very interesting examples of these atypical

forms of hypernephroma, I was led, in the course of their study, to take into consideration the chemical characteristics of the malignant renal hypernephromata, and the details of this chemical investigation have appeared at greater length elsewhere.¹ In this place I wish to put these two unusual examples of hypernephroma upon record, and to discuss certain features of interest that are considerably elucidated by the chemical investigations.

The first of these two specimens was a hypernephroma that had undergone lipomatoid transformation, resembling in some portions a sarcoma and in others a lipoma. This form of hypernephroma has recently been discussed by Keenan and Archibald.² For this specimen I am indebted to Dr. Bayard Holmes, who removed it at operation from a young woman, who some five years later was still in good health with no evidences of recurrence. To the naked eye the tumor resembled a lipoma, except that it was of a much firmer, more tallow-like consistence. It measured 13 x 10 x 7 cm., had a definite fibrous capsule, and showed several areas of hemorrhage, some of which, at least, were the result of operative trauma.

The fat tissue was interspersed with occasional bands of fibrous tissue. There were no areas of the yellowish tissue typical of hypernephromata, and no necrotic areas. Histologically this tumor showed in most sections nothing but what appeared to be fatty areolar tissue, with considerable stroma containing an unusual number of large spindle cells, suggesting a fibro-sarcomatous structure. In other areas these cells predominated, but always associated with more or less fatty areolar elements. (See Fig. 1.) Many sections were examined, indeed an entire equatorial section was reconstructed and mounted, without finding any of the adrenal-like tissue that we suspected must be present, so a tentative diagnosis of lipo-sarcoma was made. Later, Dr. F. J. Hall examined other parts of the tumor, and found areas showing typical hypernephroma structure, establishing the diagnosis of hypernephroma with lipomatous transformation. A more complete study of this specimen will be found in a report to be published by Dr. Hall, hence the anatomical features will not be gone into further at this time.

¹ *Journal of Medical Research*, 1908, xvii, No. 4.

² *Journal of Medical Research*, 1907, xvi, 121.

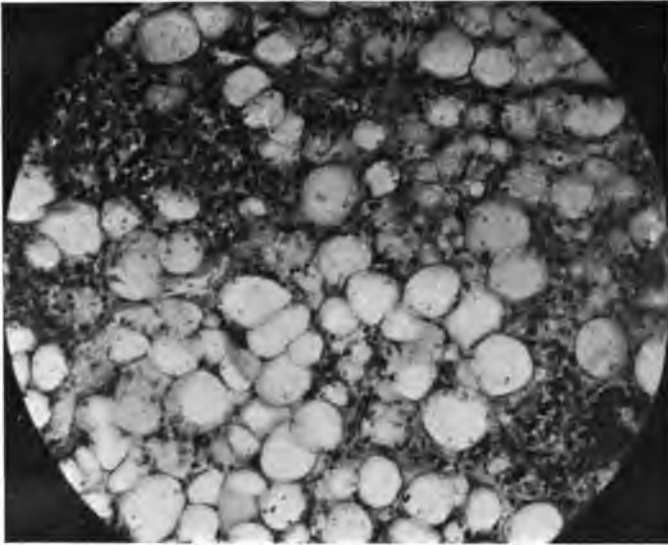
VOL. II. Ser. 18—18

Chemically the composition of the tumor was found to correspond to its histological structure, for it was nearly as rich in fat as a lipoma or a piece of fat subcutaneous tissue. The alcohol extract of three samples contained respectively 91, 91.6, and 93 per cent. of the dry weight of tumor tissue. The ether-soluble material averaged 85 per cent. of the dry weight; and the residue of the alcohol extract that was not soluble in ether did not give either the Millon's or the tryptophan reaction. One portion analyzed for cholesterin, a 6.6 Gm. sample of tumor tissue, yielded but 0.037 Gm. of cholesterin, corresponding to but 0.5 per cent. of the total weight of the tumor tissue and 0.66 per cent. of the ether extract: 5.1 Gm. of tumor tissue yielded but 0.0104 Gm. of magnesium pyrophosphate from the precipitated lecithin, or 0.0028 Gm. of phosphorus; this corresponds to 0.1064 Gm. of lecithin, which is 2.0 per cent. of the total tissue, and 2.4 per cent. of the ether extract.

The second specimen was obtained at the autopsy on a patient of Dr. J. C. Delprat, to whom I am indebted for the opportunity of studying this case. The patient was a broker, seventy years of age, but of physique and appearance suggesting a man twenty years younger. He had been in vigorous health until a few months before death, when he was suddenly attacked by what seemed to be, and probably was, a left-sided lobar pneumonia. From this he did not convalesce well, and the signs of consolidation did not clear up but were replaced by evidences of fluid in the pleural cavity; this fluid was drawn off on different occasions, but it was noticed that the physical signs improved little after such aspiration, which observation, coupled with the blood-stained character of the pleural fluid, suggested towards the end the possibility of the presence of some malignant involvement of the pleura. The patient became gradually weaker, but died rather suddenly and unexpectedly. Autopsy was performed ten hours after death, and the findings were as follows:

ANATOMICAL DIAGNOSIS.—*Malignant renal hypernephroma. Metastatic infiltration of left pleura, beginning at the base and involving the entire pleura, especially its pericardial and diaphragmatic portion. Miliary metastasis in right lung and along the bronchi of the left lung and in mediastinal glands. Hemorrhagic*

FIG. 1.



Hypernephroma resembling a lipoma with sarcomatous stroma. This photograph shows one of the more cellular parts of the tumor, which consisted of the large fat cells.

fibrinous pleuritis (left). Serous effusion in pericardium, peritoneum and right pleura. Edema and compression atelectasis of left lung. General arteriosclerosis, with calcification of abdominal aorta and splenic artery. Chronic diffuse nephritis. Passive congestion and multiple cicatrices in liver. Varicose intestinal lymphatics. Hæmangioma in wall of intestine.

EXTERNAL APPEARANCE.—Body was that of a tall well-preserved man, somewhat emaciated. Rigor mortis was well marked, and body was still slightly warm. No external evidence of the tumor.

ABDOMINAL CAVITY.—The abdominal fat was well-preserved. The peritoneal cavity contained a few cubic centimetres of clear fluid. The lymphatics of the small intestine were everywhere dilated and were filled with a milky fluid. At one point on the small intestine was a small hemorrhagic area about 2 millimetres in diameter, under the peritoneum. The vermiform appendix was free. Urinary bladder was distended. The liver extended three fingers' breadth below the costal arch; its margin was very irregular. The anterior surface of the liver was adherent to the diaphragm by very dense scar tissue; the gall bladder was somewhat distended. The spleen was slightly adherent about the hilum. There were thickenings of the upper part of the sigmoid mesocolon. The mesenteric lymph glands were not enlarged. The abdominal aorta was greatly sclerosed and calcified. There was a large growth to be felt continuous with upper pole of the left kidney; the growth appeared not to be continuous with the diaphragm. On the right side the diaphragm reached the 4th costal interspace; on the left side it could not be moved at all, as it was fixed, and felt as if solid for a great thickness above. There were no changes visible on its peritoneal surface.

PLEURAL CAVITIES.—The costal cartilages were completely ossified. On removing the sternum the right lung collapsed. The right pleural cavity contained about 500 cubic centimetres of clear fluid. There were some fibrous adhesions to the diaphragm. On palpation of the lung, numerous nodules of a fleshy consistency, ranging in size from a pin head to six conglomerate masses each one centimetre in diameter, could be felt. These were mostly beneath the pleura, but some could be felt deeper. The lymph

glands at the hilum appeared uninvolved. The anterior mediastinum was filled with a solid white mass of about the firmness of a cirrhotic liver; this extended from a line crossing the right border of the sternum towards the left, and infiltrated the anterior surface of the pericardium. The growth involved the entire parietal pleura on the left side reaching upward to the apex of the lung. It seemed to infiltrate somewhat between the ribs but did not appear on the external chest wall nor did it involve the ribs. There was a space between the two layers of the parietal pleura containing several hundred cubic centimetres of thin blood-stained fluid, lying in the meshes of a soft fibrinous exudate. The tumor appeared densest and thickest along the vertebral column near the diaphragm. The parietal pleura on the left side when shelled out appeared uniformly thickened—at least one to two millimetres thick—with fibrous tissue, which everywhere was studded with white nodules of from one-half to one centimetre in diameter, and frequently aggregated into large clusters. The growth reaches its greatest thickness at the base of the pleura, in the vicinity of the diaphragm, and along the anterior margin of the left pleura; here it is from two to four centimetres thick. Where not obliterated, the pleural cavity was filled with a blood-stained serous exudate that clotted almost immediately on exposure to the air. The lower third of the cavity was filled with a sacculated hemorrhagic fibrinous exudate, containing fluid-filled cavities as large as six centimetres in diameter.

PERICARDIAL CAVITY.—On opening the pericardial sac about 200 cubic centimetres of a clear fluid were found in it. The growth did not perforate the pericardium at any point, though its outer wall was everywhere infiltrated and its inner surface was somewhat congested.

HEART.—The heart was of normal size; the coronary arteries were thickened, tortuous and hardened. The left ventricle was slightly thickened, the beginning of the aorta was almost free from sclerosis. All valves appeared normal.

LUNGS.—There was nothing beyond what has been noted above observed in the right lung, with the exception of some posterior hypostatic congestion. The left lung was compressed towards the inner side of its cavity, was airless, contained a great deal of fluid,

and was studded with small tumor nodules. These were located chiefly beneath the pleural surface, where they formed an almost continuous layer, and a few small nodules were scattered along the bronchi. The tumor itself formed a uniform layer ten to twenty millimetres thick on the diaphragmatic pleural surface of the lung. It apparently consisted of fused nodules about the consistency of liver tissue, yellowish-white in color and nowhere hemorrhagic or necrotic. The greatest involvement was at the posterior angle between the diaphragm and the vertebræ, and was about four centimetres in thickness. The growths in the upper part of the parietal pleura evidently came from this.

LIVER.—The liver was greatly deformed by large, irregular scars, involving both lobes, the left somewhat the more. The tissue was firm in consistence, mottled in color. On cutting, the surface shows the centres of the lobules dark, the typical "nutmeg" appearance. Beneath the scars were areas of yellowish tissue, that seemed to be altered atrophic liver tissue. No tumor growth present.

SPLEEN.—The spleen was slightly enlarged, very soft, and very pale, and on cutting, the surface was soft. The splenic artery was calcified into a tortuous tube.

KIDNEYS.—The left kidney was firm, red, with a capsule that stripped easily, leaving a granular surface. The cortex was thinner than normal. Its markings were indistinct, its consistence very firm. Continuous with this kidney and reaching to and adherent to the under surface of the diaphragm, was a mass of yellowish-white tissue about seven centimetres long and four and a half centimetres wide. The mass showed no evidence of continuous growth between itself and the diaphragm. It involved the outer aspect of the upper pole of the kidney principally, its lower border being just below the middle of the organ. It apparently did not infiltrate the kidney but extended into it, it seemed, by pressure atrophy. The growth seemed to contain a great deal of firm connective tissue, and to radiate somewhat from its centre. There were a few small foci of necrosis, but otherwise no evidence of this nor of hemorrhage; there was one small-sized cystic cavity. The description of the right kidney corresponds to the description given to the left, except for the absence of any tumor mass.

THE ADRENALS.—The left adrenal appeared to be quite unin-

volved in the abnormal growth. The right presented nothing abnormal.

GASTRO-INTESTINAL TRACT.—No abnormalities detected except the dilations and the varicosities of the intestinal lymphatics.

LYMPH GLANDS.—Those of the abdominal cavity are not involved, but there are a few large retroperitoneal glands near the diaphragm. Several of the glands of the anterior mediastinum are swollen to two or three centimetres diameter, and are soft and white on section, while there are several clusters of similar glands in the posterior inferior mediastinum.

As can be readily seen from the above description, the gross anatomical features were entirely unlike those of any typical case of hypernephroma. Anatomically as well as clinically the chief seat of the disease seemed to be in the left pleura (see figure 2), where a massive, firm, white growth apparently originated in the diaphragmatic pleura and spread upward over the entire parietal pleura, with subsequent lymphatic transportation to the mediastinal lymph glands. There was nothing whatever to suggest that these growths were of suprarenal origin except for the growth in the left kidney, and this itself was entirely unlike any hypernephroma that I had ever seen (see figure 3). The typical malignant renal hypernephroma is characterized by its yellowish color, which recalls the color of the adrenal, numerous areas of necrosis and hemorrhage, soft consistence, and a tendency to replace the kidney tissue without greatly altering the form of the kidney; whereas this tumor was situated as an excrescence beneath the capsule, nearly white in color, of uniform firm consistence, and showing no hemorrhages and practically no necrosis. Furthermore, the extension of the growth seemed to have been entirely through the lymphatics, while the typical hypernephroma is much more prone to extend by way of the blood vessels, although lymphatic dissemination of this class of tumors is much more frequent than one would imagine from the statements in the literature. With all these considerations in mind, it was concluded that the tumor was probably a primary endothelioma of the pleura with secondary involvement of the mediastinal glands and the left kidney.

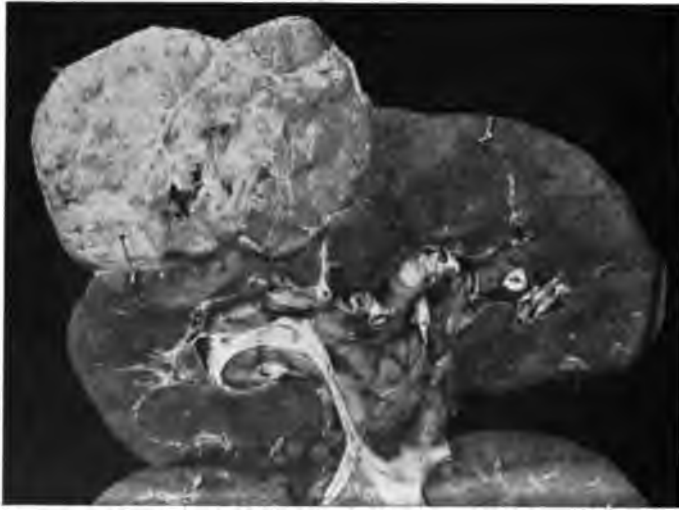
As atypical as were the gross features, they scarcely surpassed in this respect the microscopical findings. In the primary tumor

FIG. 2.



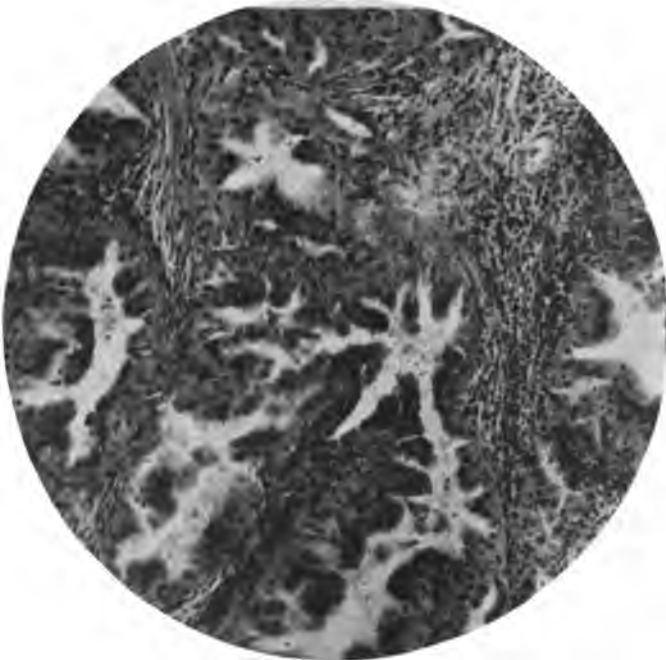
Secondary hypernephroma in left pleura and lungs. The extensive infiltration with white tumor tissue is seen to be most marked in the diaphragmatic pleura, but extending through all parts of the parietal pleura. The lung is collapsed by the pressure of the clotted bloody exudate between it and the diaphragm, while the visceral pleura shows nodular metastases; a slight extension along the peribronchial lymphatics can also be made out.

FIG. 3.



Primary hypernephroma of left kidney. The relatively small size of this primary growth as contrasted with the massive secondary growth in the pleura is striking.

FIG. 4.



Primary hypernephroma of kidney, showing a papillary structure. The epithelium is high and solid, free from the vacuolization common in adrenal cells; the stroma is packed with small round cells.

the structure was entirely unlike any ordinary hypernephroma in almost every respect, for in nearly all parts it reproduced a papillomatous growth, not dissimilar to the variety occasionally found in the kidney and commonly believed to be of renal rather than of aberrant suprarenal origin (see figure 4). These papillary formations possessed a stalk of connective tissue, poor in vessels but packed with small densely-staining spherical nuclei, while the epithelial elements covering them were of a high columnar type with a cytoplasm that stained densely and uniformly with eosin. Only in a small focus could any cells be found that contained vacuoles, and with these exceptions the cells were totally unlike those of the adrenal or of a typical hypernephroma; they resembled much more the epithelium of the convoluted tubules of the kidney in structure, and their extreme papillary arrangement is not characteristic of typical hypernephromata, although frequently indicated in parts of such tumors. If one were shown sections of this primary tumor alone he would be most unlikely to suspect the possibility of hypernephroma unless unusually familiar with the polymorphism of these tumors. On the other hand the secondary growths in the peribronchial glands are as typical examples of hypernephroma as can be imagined, and would be recognized as such at the first glance; the cells are greatly vacuolated, and in size, shape, and arrangement recall at once the structure of the suprarenal. In the pleural growths, and in the peribronchial pulmonary metastases, the cells are of the same type as in the lymph glands, but being compressed by the more abundant stroma do not show so typical an arrangement of the cells; however, the appearance is characteristic enough so that their origin would be at once suspected. The more detailed description by Dr. E. G. Kirk follows:

Primary Tumor.—A section through the whole tumor was made by the reconstruction method; twelve pieces forming an equatorial section were cut and stained separately and then apposed. In general, the part of the tumor not directed towards the kidney has a dense fibrous capsule, infiltrated densely in many places by small round cells; the part towards the kidney has a thin capsule, or else none, the tumor infiltration blending gradually with altered

kidney tissue. A large part of the tumor presents a papillomatous appearance, consisting of many strands of very cellular connective tissue with papillæ and sub-papillæ projecting from the sides; the whole covered by a high columnar epithelium of the palisade type. Other areas present many tubules with parallel sides. A greater part of the tumor, therefore, presents a rather regular organoid appearance. Nevertheless, there are many fields which show no tubules nor papillomatous structure; thus, some areas are of solid masses of cells with large vesicular sarcomatous-appearing nuclei. At one place a concentric, whirl-like structure, like a carcinoma nest, surrounded by a fibrous and cellular capsule; also scattered areas, mostly small but some visible microscopically, of fatty degeneration, hemorrhage and fibrin deposit, caseation and necrosis. In a few places the cells have a vacuolated appearance suggestive of hypernephroma, but for the most part the cells are solid, staining uniformly and intensely with eosin, and resembling much more the normal epithelium of the convoluted tubules of the kidney or normal liver cells.

Pleura.—Greatly thickened and infiltrated throughout by metastatic growth. The tumor cells are large and have vesicular, spindle shaped, or spherical nuclei. They are arranged somewhat in groups separated by strands of stroma, and thus resemble an alveolar carcinoma. They fill up the lymph channels very largely.

Mediastinal Lymph Glands.—The normal structure has been almost entirely replaced by the close-packed infiltration of all the lymph sinuses by large tumor cells, which have the same structure as those described in the pleura except that they show a greater tendency to vacuolization. The general appearance is suggestive of hypernephroma, and in most places the arrangement and structure of the cells is perfectly typical of this form of tumor.

Lung.—Slight congestion. The alveolar epithelium is swollen, oedematous, and often partially desquamated. In some places pressure atelectasis and oedema. Many small and large metastatic tumor nodules of the same general type as described under the pleural tumor. The tumor stroma is markedly vascular, and the location about the bronchi shows that the implantation has been by extension along the peribronchial lymphatics.

CHEMICAL STUDIES

There has been but little chemical investigation of the chemical composition of this interesting class of tumors, the only references with which I am familiar being the following:

In 1897, at a time when the relation of the renal hypernephromata to misplaced adrenal tissue was under dispute, Gatti³ published the results of an analysis of a typical specimen of this form of tumor, which added much to the support of the affirmative side of the question. He found in his specimen that 3.47 per cent. of the fresh weight consisted of lecithin, a proportion that agreed well with that observed by others in normal adrenals. Some years later Beebe⁴ published a series of analyses of several tumors of various sorts, among them a hypernephroma. In this he found much glycogen, as has been repeatedly observed microscopically in this class of tumors; also there were present free tryptophan, leucin, and tyrosin, because of the autolysis occurring in necrotic areas. In addition he found 29 per cent. by weight of the tumor to be soluble in ether, and 18 per cent. of this ether extract was cholesterolin; lecithin was also present, but it was not determined quantitatively. As cholesterolin is known to be abundant in adrenal tissue this observation may be considered as further evidence in favor of the adrenal origin of hypernephromata, although this origin is now generally conceded. Within the past year Delamare and Lecene⁵ report that in a hypernephroma studied by them substances were found that were turned brown by osmic acid, and the presence of lecithin was demonstrated, but not quantitatively, by Alder. They state that this constitutes an entirely new and weighty piece of evidence in favor of the adrenal origin of hypernephromata, being totally unfamiliar with the observations of Gatti and Beebe. Finally Croftan⁶ states that hypernephroma tissue resembles adrenal tissue in causing glycosuria when injected into rabbits, and in splitting starch into sugar.

In view of the peculiarities of the two exceptional cases of

³ *Virchow's Archiv.*, 1897 (150), 417.

⁴ *Amer. Jour. of Physiol.*, 1904 (11), 139.

⁵ *Compt. Rend. Soc. Biol.*, 1907 (62), 442.

⁶ *Virchow's Archiv*, 1902, clxix, 332.

hypernephroma that are described above, it seemed desirable to extend the study of the fats and lipoids of this variety of tumors, for several reasons:—First, to determine if the isolated results of Gatti and Beebe agree with a general rule that the hypernephromata resemble the adrenal tissues in their richness in lecithin and cholesterolin; second, if this richness in lipoids is peculiar to hypernephromata or is common to other tumors; third, if the lecithin and cholesterolin are integral parts of the hypernephroma cells, or are present as products of the cellular degeneration which occurs so abundantly in typical hypernephromata, both as areas of focal necrosis and as general vacuolization of the cells.

The details of this chemical study are given in another publication,⁷ and only the results will be given here in the following table:

	Normal Adrenal.	Hypernephromata.				Carcinoma of Gall Bladder.	Carcinoma of Breast.	Sarcoma, secondary, in Liver.
		1	2	3	4			
Ether-soluble material	36.3	28.0	33.0	38.4	85.0	8.6	21.4	14.5
Cholesterolin, per cent. total dry weight	7.6	4.6	6.7	8.7	0.5	2.2	0.9	1.6
Cholesterolin, per cent. dry, fat-free substances	11.9	6.4	10.0	14.0	3.3	2.4	1.2	1.9
Cholesterolin, per cent. ether-soluble substances	20.6	16.9	20.4	22.9	0.7	26.1	4.3	11.0
Lecithin, per cent. total dry weight ..	11.8	6.0	9.0	8.3	2.0	1.7	0.7	6.2
Lecithin, per cent. dry, fat-free substances	18.4	8.3	13.4	13.4	13.3	1.9	0.9	7.3
Lecithin, per cent. ether-soluble substances	33.0	22.7	27.5	21.4	2.4	20.0	3.0	39.8

Hypernephroma No. 1.—Typical specimen, with the usual amount of hemorrhage and necrosis; cells much vacuolated.

Hypernephroma No. 2.—Similar to No. 1.

Hypernephroma No. 3.—Primary growth resembled more a papilloma than an ordinary hypernephroma in most places; no vacuolization of cells, little necrosis, and no hemorrhage.

Hypernephroma No. 4.—Tumor resembling a lipoma, with a

⁷ *Journal of Medical Research*, 1908, xviii.

stroma in places resembling a fibrosarcoma in structure. In only a few areas were cells present resembling adrenal tissue, most of the tissue resembling fatty areolar tissue.

Of these tumors the most typical specimen of hypernephroma was No. 2, which, as will be seen from the table, agrees closely as to composition with the adrenal. No. 1 was quite as typical a specimen, but had been preserved longer, which probably accounts for the lower figures obtained for all the constituents. The figures for these two specimens, when contrasted with those obtained with the three specimens of malignant tumors other than hypernephroma, seem to determine the first two of our questions; namely, that typical hypernephromata resemble normal adrenal in the amount and relative proportions of the fat, cholesterin and lecithin that they contain, and that other sorts of tumors do not show this resemblance to adrenal tissue. The analysis of the atypical papillary hypernephroma of the kidney (No. 3 in the table) gives most interesting results. First, we find that although there is almost no evidence of the presence of fat to be detected with the microscope, yet no less than 38.4 per cent. of the total solids of this tumor are fats and lipoids; this corroborates Rosenfeld's observations on the lack of agreement between the microscopical evidence and the results of chemical analysis in determining the amount of fat present in the parenchymatous tissues. Secondly, we find that here also the proportion of lecithin and cholesterin is quite similar to that in the normal adrenal, establishing that these lipoids are essential and characteristic constituents of cells of adrenal origin, and that their abundance in hypernephromata is entirely independent of necrotic foci and cellular vacuolization. Furthermore, it would seem to be indicated that quantitative estimation of the lecithin and cholesterin of a tumor may serve as a means of determining the adrenal origin of a suspected tumor, even when the microscopic evidence is uncertain; if this tumor (No. 3) had been obtained at an operation and the typical hypernephroma metastases had not been available for study, it is very doubtful if its nature could have been definitely established by histological examination.

As to the lipoma with lipomatoid transformation (No. 4) the analysis shows, as the histological structure indicated, that nearly

all (five-sixths) of this tumor is composed of neutral fats. In this fatty material is only a relatively small amount of cholesterin and lecithin, although when compared with the fat-free tumor tissue the proportion of these substances is found to be relatively quite high. This indicates that the excessive fat is probably simple depot fat, infiltrated from outside, as in Rosenfeld's classical experiments on fatty metamorphosis, for if derived through "degeneration" of the tumor cells one might expect it to contain more lecithin and cholesterin. On the other hand the quantities of these lipoids that are present are much greater than they are in ordinary lipomata, where Jaeckle found but 0.34 per cent. of cholesterin and 0.015 per cent. of lecithin in the ether extract, so that even in this lipoma-like tumor the chemical analysis indicates the relation to the adrenal tissue from which it undoubtedly arose, a relation that it was very hard to establish by the microscope.

Summary.—As the general conclusions of these studies may be stated: 1. The renal tumors that arise from misplaced embryonal adrenal tissue may present most extreme variations in type, ranging from those resembling sarcomata, to those resembling papillary carcinomata, and again being difficult to distinguish from lipomata. It is probable that many tumors of the kidney that should be classed among the hypernephromata are mistaken for carcinomata, endotheliomata, sarcomata, and even lipomata. 2. A primary renal hypernephroma of atypical structure may produce secondary growths resembling typical hypernephromata in every detail. 3. Dissemination may be by means of the lymphatic vessels exclusively, in one of our cases producing a condition resembling closely a primary endothelioma of the pleura with secondary lymphatic dissemination; more often metastasis is by way of the vascular system, the hypernephroma growing into the main trunk of the renal vein in many cases. 4. Hypernephromata are characterized chemically by containing fat, lecithin and cholesterin in large amounts, the proportions found being quite similar to those characteristic of the normal adrenal. In this way the adrenal origin of an atypical renal hypernephroma may be established by chemical means. 5. The fats and lipoids are integral constituents of the tumor cells, the amount not depending upon retrogressive changes, and bearing no

relation to the microscopical evidences of fatty alteration in the tumor cells. 6. In a fatty tumor of the kidney, resembling a lipoma with sarcomatous stroma, but of undoubted adrenal origin as established after microscopic study, the amount of lipoids was small, nearly all the fatty matter being body fats. We know of no reason why hypernephromata should undergo this peculiar fatty transformation.

For the illustrations I am indebted to Dr. W. J. G. Land and Mr. H. E. Potter.

RECENT RESEARCH INTO THE PATHOLOGY OF MALIGNANT DISEASE

BY CHARLES E. SIMON, M.D.

of Baltimore, Md.

IF we analyze the achievements of modern medical science in the prophylaxis and treatment of the acute infectious diseases we have every reason to feel encouraged and to believe that the time is not so far distant, when the majority of these diseases will be as rare in civilized communities as cholera, plague and smallpox are at the present time. This happy result is essentially the outcome of the introduction of the experimental method into medical research. If at the present time the rate of morbidity is still high in such diseases as tuberculosis, typhoid fever, diphtheria, measles and scarlatina this is largely owing to ignorance on the part of the laity and lack of interest on the part of state and municipal authorities. It need no longer be such. If the rate of mortality of diphtheria is still relatively high, if puerperal and post-operative infections still occur only too frequently, we must recognize that this also need not be, and that with a further education of the public and with better training of the medical student and the physician the number of deaths will progressively diminish. This advance, as I have said, is largely due to the introduction of the experimental method into medical science, and to our ability to study many of the pathological questions involved in the animal experiment.

As so much has been accomplished as a consequence, in relatively so short a period of time, the thought naturally arises, why is it that so little advance apparently has been made in the study of malignant disease. The answer readily follows: because the experimental method has until recently not been applicable in this field. It is true that our knowledge of the pathological anatomy of malignant growths has been wonderfully extended since the epoch-making studies of Johannes Müller and Virchow, and that the surgical achievements in the treatment of cancer have been largely

reached upon this basis; but withal we must acknowledge that our knowledge of the etiology of malignant disease and of many important associated biological problems, has been but little extended in this manner and that barring surgical intervention we are still hopelessly ignorant of any therapeutic measures by which the disease can be successfully combatted. Attempts have not been lacking in the past to introduce the experimental method into this field of pathology also, and I need only refer to the early attempts at transplantation by Langenbeck, Follin and Lebert, Weber, Gongou, Klencke, Lanz, Billroth and others to show that its importance was in a measure realized. But the results were discouraging, usually indeed altogether negative, so that systematic investigation along these lines was not unnaturally long delayed.

From the experiments made it was manifest, that human cancer can be successfully transplanted from one part of the body to another and that transplantations from man to animals are rarely successful. This was the status in 1889, when Hanau succeeded in transplanting carcinoma successfully from one rat to other rats. It had previously been known that various tumors may occur in the lower animals. Huzard in the eighteenth century already had called attention to the frequent occurrence of carcinoma and Trousseau and Leblanc as well as Seumer have described tumors in animals previous to Hanau's time. Doutrelepoint indeed had attempted transplantation of a carcinoma occurring in a dog to other dogs, but his results were negative. Novinsky claimed to have been successful in a similar attempt, but from the meagre data it is not possible to come to a satisfactory conclusion. Although Hanau's work was published both in the *Fortschritte der Medizin* and in Langenbeck's *Archiv* it attracted relatively little attention and it is curious that until 1901 transplantation experiments from animal to animal are reported by only a few investigators; not even after Morau had shown that mouse carcinoma can be transplanted through generations of mice and that a possibility thus existed of studying the biology of malignant growths in animals which are most convenient for laboratory research, both through their size, their cheapness and the number that can be readily available.

In 1901 there followed the epoch-making experiments of Jensen

and in 1902, a year before the appearance of Jensen's paper in the *Centralblatt für Bacteriologie und Pathologie*, the equally important researches of Loeb. The work of these two investigators must be regarded as the true basis of our modern experimental work in the study of malignant disease and with this work we have entered upon a new era which, it is fondly hoped, will see a very material advance toward the solution of what has been one of the most difficult problems in human pathology. Much indeed has already been accomplished, but much more still remains to be done.

One of the immediate results, no doubt, of the recognition that animal cancer is comparable directly to human cancer and is transplantable from animal to animal, and that human cancer is thus open to investigation by the experimental method, has been the establishment of special institutes for the study of cancer and a wide spread interest in the work which is there done. In Germany such institutes have been established in Berlin, Frankfurt and Heidelberg under the leadership of v. Leyden, Ehrlich and Czerny respectively. In England we have the Imperial Cancer Research Fund under the direction of Bashford, and the cancer research laboratories of the Middlesex Hospital under Lazarus-Barlow. In Russia also a special institute for cancer research exists under the direction of v. Levschin. All these have been established within the past seven years. In the United States the New York State Institute for cancer research was opened in Buffalo in 1880. A special fund, the Caroline Brewer Croft Fund for cancer research (established in 1893), is administered by a commission of the Harvard medical school, and since the establishment of the Rockefeller Institute for medical research in New York active work in cancer research has also been inaugurated there. Experimental research along these lines is further being conducted in many other laboratories the world over, but the establishment of the special institutes mentioned, more particularly, shows that a determined effort is being made to penetrate the mystery with which the biology of the cancer cell has so long been shrouded; it shows, moreover, that the foremost scientists of the world feel that the time has come where such research may be profitably undertaken and should be continued regardless of expense.

Only a few years have passed since systematic research along experimental lines was thus begun and already we have come into the possession of a great deal of new and valuable information. This has been reached very largely through work on mice, and to this I shall for the present confine my remarks. Jensen already noted the fact that under ordinary circumstances not all tumors occurring spontaneously in mice can be transplanted, even though they be of carcinomatous nature. Of 108 tumors in which transplantation was attempted by Ehrlich, positive results were thus only obtained with 14, and with these, continuous transplantation in strains was possible in only nine. But even then the percentage of positive transplantations is quite variable; with some tumors a relatively large positive yield is obtained, while others tend to die out, or are kept active only with difficulty. Practically important is the fact that by artificial selection the "virulence" of a given strain can be increased and in this manner tumors have been obtained which yield anywhere from 50 to 100 per cent. of positive transplantations. This has greatly facilitated certain phases of cancer research in which it is essential to have large numbers of tumor animals at one's disposal. Of the nature of this increase in virulence, viz., its underlying causes, nothing is as yet known, but it is manifestly dependent upon changes in the cancer cell itself.

The fact that only a small number of primary mouse tumors are transplantable would suggest that the virulence of these tumors is naturally of a fairly low order and is a matter which is intimately connected with the question of natural immunity. Some remarkable idiosyncrasies have here been noted. Michaelis thus found that the Jensen tumor, which with Jensen gave about 50 per cent. of positive results with Copenhagen mice, would not grow on Berlin mice. Bashford had similar difficulties at first with the same tumor in the case of London mice, but succeeded after some time in adapting it to its new soil. It is a common experience also that the wild house mouse, *Mus musculus*, is more resistant to the tumors of white mice than the latter, and it is noteworthy that this resistance can at times be overcome and that transplantation proceeds more readily, when once a footing has been gained. With other wild mice, such as *Mus sylvaticus*, *M. agrarius*, *Arvicola agrestis*, *A.*

glareola and *Myoxus avellanarius*, attempts at transplantation with the white mouse tumor have been unsuccessful.

The common mouse carcinoma is found exclusively in old animals and most commonly in old females, where it usually has its starting point in the mammary gland. But it is noteworthy that transplants will grow equally well in males and better in young than in old animals. This corresponds to what we see in human pathology, where the disease also attacks older persons with preference, and where growth is apt to be peculiarly active, if, perchance, a younger person is affected. It shows very clearly that younger animals are less prone to the appearance of cancer, but that they cannot offer any peculiar resistance to the disease, when once it has started. This fact seems to me a serious obstacle to Cohnheim's theory regarding the development of cancer from aberrant epithelial cells, which supposedly lie dormant until with advancing years the general resistance of the body to their further growth is lowered and the disease develops in full force. If such were the origin of cancer we would certainly expect the disease to appear early instead of late in life, seeing that cancer growth in young animals is more active, when once cancer cells exist in the body of the animal. This of course does not affect the question why cancer appears more commonly in older persons. As the soil is favorable already early in life it would perhaps not be unnatural to conclude that the causative factor which produces cancer is a relatively uncommon factor, and that the appearance of the disease late in life is essentially due to more frequent exposure in a person of maturer years.

The rapidity of growth in positive transplants varies considerably and is in a general way proportionate to the percentage of positive results. In one strain of Ehrlich's the weight of the tumor at the end of the first week was 2 grammes, after two weeks 3 grammes, after three weeks 5 grammes and after two months it may equal the weight of the mouse. As this rate of growth may continue, within certain limits, through generations after generations an idea may be formed of the wonderful developmental energy which is inherent in certain cancer cells. There is thus an absolute difference between the cancer cell and all other tissue cells of the mouse, unless we compare it with the specific reproductive cells,

in which, however, a new factor is added in the process of fertilization. It is noteworthy that the original Jensen tumor has been growing for five years in transplants in different parts of the world. To illustrate the enormous potential growth Ehrlich has made a calculation which goes to show that starting with one of his most virulent tumors after 70 generations of continuous transplantation, in sets of ten, a theoretical growth would be obtained corresponding to a cube of such size that a ray of light travelling at the rate of 300,000 Km. a second would pass along this mass for a period of 100,000 solar years!

One of the most remarkable results of transplantation work is the discovery that after a number of generations has been passed the carcinomatous structure of the mouse tumor may be lost and replaced more or less gradually by the appearance of sarcoma of various types. This observation which was first made by Ehrlich has been confirmed by other investigators. Loeb thus noted the development of a sarcoma already in the first generation after transplanting carcinoma. Bashford obtained similar results, and Lewin reports that starting with a rat carcinoma, of mammary origin, viz., an adenocarcinoma, he obtained typical areas of epithelioma with typical hornification in the third generation. From the fourth generation off by transplanting intraperitoneally he obtained the typical picture of an epithelioma solidum without hornification, while with subcutaneous transplantation the latter was the predominating feature until the seventh generation (incl.) was reached. As these transplantations progressed the stroma of the tumor also showed remarkable changes. In three series of the fifth generation extensive connective tissue growths were obtained with practically no admixture of epithelial elements; they consisted very largely of spindle cells and were capable of transplantation. From the seventh generation off he obtained tumors which were manifestly pure sarcomata, some of them composed almost exclusively of round cells, while in others spindle cells predominated. In order to understand the meaning of these remarkable changes in the cellular types of the transplanted growth, it is essential to realize that of the originally transplanted cells (in the case of carcinoma) only the specific epithelial elements survive, while the true stroma of the resulting growth, which is the bearer of the blood supply, is

furnished by the host. This has been satisfactorily demonstrated by Jensen and Bashford and we may accordingly assume that the introduction of the cancerous epithelial elements results in a direct stimulation of the fibroblasts (sc. angioblasts) of the host. If this does not occur growth cannot occur. The rate of connective tissue formation, however, is manifestly quite variable. In the vast majority of mouse carcinomata it is relatively slight, not sufficiently active in fact to insure an adequate blood supply to the rapidly growing tumor, and as a consequence we find that the central portion of all large growths is extensively necrotic. According to Ehrlich the development of sarcoma is due to some chemical change in the cancer cell, in consequence of which the connective tissue of the host is stimulated to excessive activity. As the degree of sarcoma formation is not of the same intensity in the various tumors of a series he further assumes that there is a varying susceptibility on the part of different animals to a stimulus of constant intensity. This is quite in accordance with what we see of the tendency to keloid formation in man.

If animals are inoculated with a mixture of carcinomatous and sarcomatous tissue, mixed tumors result which are perfectly analogous to what is seen when a carcinoma gradually changes to a sarcoma, on successive transplantation, and corresponds to the so-called carcinoma sarcomatodes of v. Hansemann. When such mixed tumors are cultivated for some time the carcinomatous component is gradually crowded out by the connective tissue. This same result can be artificially produced by heating the mixed injecting material; but it is noteworthy that while this is the rule, it may occur that in some subsequent generation both components appear in the same tumor side by side, no longer as mixed tumor, and from the two components new generations of carcinoma and sarcoma have been cultivated. The resultant carcinomata, however, differ from the original tumor in their slow growth and the greater amount of connective tissue formation, which sharply separates the carcinomatous alveoli from each other. Manifestly this strain has been materially weakened in virulence by the process of heating.

Through the investigation of Jensen and Ehrlich more especially some very interesting information has been obtained regarding the vital tenacity of the cancer cell, which stands in marked

contrast to the behavior of other normal tissue. Jensen showed that positive transplants can be obtained after the tissue has been kept in the ice box for eight days, and remarks that in this respect cancer cells are less resistant than normal epithelial tissue, which according to Wentscher and Flörcken may retain its vitality for a number of weeks. Jensen further observed that, while an exposure for five minutes to temperatures of -12° , -16° and -18°C . does not kill the cells the same exposure at a still lower temperature will prevent further development. Ehrlich, on the other hand, reports that he has repeatedly obtained transplants from material which had been kept for forty-eight hours at -25° and -30°C ., and he mentions one instance where a growth was obtained from a carcinoma which had been kept for two whole years at 8° to 10°C . below the freezing point. He adds that these low temperatures do not represent the limit for a transplantable chondroma which he has in his collection, and with this he still obtained growths even after exposing the material for three days to the temperature of liquid air. Such growths, to be sure, were of a low grade of virulence and gradually underwent resorption, but the fact remains that they developed after exposure to such a low temperature.

The upper limit of vitality, on the other hand, is quite low. Carcinomatous and sarcomatous cells are destroyed by heating for one hour at 50°C ., while chondromata may yet be transplanted; but, as after exposure to low temperatures, they give rise to abortive tumor formation only. At body temperature the cells cannot be preserved for even twenty-four hours, while at room temperature they may remain alive for 2-12 days. Their early death at the temperature of the body is due to autolysis and may be greatly hastened by placing the cells in saline solution. If they are suspended in normal blood serum, however, they may be preserved for several days.

The behavior of cancer cells toward carbolic acid differs widely from that of bacteria and other minute parasites, as they are readily destroyed by exposure to 0.35 per cent. carbolic for five minutes, while bacteria and various other unicellular parasites are more resistant. Chloroform likewise acts as a strong poison. These data are important, as it is thus readily possible to prepare and preserve carcinomatous vaccines for purposes of immunization.

While it has been abundantly demonstrated that successful continuous transplantations of mouse tumors are only possible in the same species, it is interesting to note that an actively growing mouse cancer (notably the sarcoma) can be transplanted to a rat and that for a period of approximately a week it will there grow with the same intensity as a corresponding bit of the same tumor that has been transplanted to another mouse. But whereas the growth steadily continues in the mouse, in the rat it ceases, and after about a week the cells become necrotic and are either absorbed or cast off by sloughing. If, however, at a time, when the transplanted tumor in the rat has reached its maximal growth a transplant is made to a second rat, no growth whatever will take place, while simultaneous transplantation to a mouse will lead to the development of a tumor. From the resulting mouse tumor, transplants can again be made to a rat, where it will grow for a week and so the series mouse—rat—mouse—rat can be continued indefinitely. This experiment is very important in principle, as it throws some light upon the immunological questions which are involved. The fact that growth will take place in the beginning, very active growth in fact, tends to show that there are no antibodies in the rat to a mouse cancer. The subsequent resorption, on the other hand, could be explained by assuming that as a result of the tumor growth antibodies are formed, and that these lead to the destruction of the cells. As a matter of fact there can be no doubt that such antibodies are formed, for it has been ascertained that rats which have been once inoculated with mouse cancer have become refractory to subsequent inoculations.

Ehrlich thinks, however, that the production of antibodies does not explain the fact that at this stage the tumor can be successfully retransplanted to a mouse, without any impairment of its proliferative energy. He explains this phenomenon by the assumption that the growing mouse cancer requires in addition to the common foodstuffs a specific substance, which we may term X, which must be present to insure continued growth, even though the amount may be very small. When the transplant from mouse to rat is first made, an amount of this substance X is transferred, which is sufficient to insure the growth of the tumor to a certain point. Sooner or later this supply is exhausted and growth then ceases,

unless the tumor is retransferred to another mouse, where the presence of X permits growth to continue. Transfer to a second rat leads to a negative result because X is absent here, and because the inherent supply has already been exhausted. The natural immunity of the rat from mouse cancer is thus different from the types of immunity with which we have been familiar heretofore, and is essentially dependent upon the absence of a specific incitor element which is essential to the growth and nutrition of the cells. This type of immunity Ehrlich designates as atreptic immunity (from the Greek word *τρέφω*, to nourish).

I have mentioned above that rats which have been inoculated with an actively growing mouse cancer, and in which temporary growth has taken place, are thus rendered immune to subsequent inoculations. This also occurs in those mice in which growth has first occurred, but in which the tumor has subsequently undergone resorption. The frequency with which this occurs varies with different strains, but it is not an uncommon event. The same is the rule in the so-called zero mice, viz., in those animals in which primary inoculation is not followed by the development of growth. The recognition of this fact is of fundamental importance, as it shows that active immunization against cancer is possible and as it suggests the possibility that this principle may also be utilized in the human being. Jensen already realized its importance and refers to his own experimental work in this direction. He states: "It seems to be possible to produce an active immunity in healthy mice, and to cause the resorption by immunization, of small tumors which have already developed, as the result of previous inoculation." He adds that he also immunized rabbits against mouse carcinoma and was able to protect mice with this serum against subsequent inoculation; in some instances he even achieved resorption of tumors that had already begun to grow. His results, however, were not constant.

Michaelis, on the other hand, reports that he was unable to produce immunity by inoculating mice with cancer material which had been killed off with chloroform, that such mice reacted to subsequent inoculations like untreated animals.

Ehrlich's work stands in marked contrast to these negative results, and not only confirms Jensen's work, but amplifies it. It

is noteworthy that his immunizations were carried on with living material and that the subsequent inoculations and controls were made with a full virulent strain, which was known to furnish 100 per cent. of positive transplants. As immunizing material he used spontaneous mouse tumors, possessing a low grade of virulence, not yielding more than two per cent. of positive transplantations, and especially the common hemorrhagic tumors, with which scarcely one-fifth of one per cent. of positive results are obtained. If then animals which have received one such injection are subsequently inoculated with the virulent strain immunity develops in from 66-94 per cent. Ehrlich explains these variations by various accidental factors, and is emphatic in his statement that he has never failed to obtain a marked immunizing effect even after a single injection, and that he has no doubt that by a repetition of the procedure complete immunity could be readily obtained. This immunity develops very rapidly—after a week or two already—and persists for weeks and months—how long, has not yet been determined.

One of the most remarkable results which have been obtained from these immunizing experiments is the discovery by Ehrlich that immunization against carcinoma also protects against sarcoma and *vice versa*. In the case of chondroma, on the other hand, a carcinoma or sarcoma immunity protects only to a certain extent, and not in all cases; the impression is gained as though full protection could only be secured by increasing the carcinoma or sarcoma immunity to its maximum point. The idea of a possible pan-immunity against tumors thus does not appear so far fetched.

Stimulated by these experiments and certain theoretical considerations attempts at immunization have been made in the human being, in cases in which tumors already existed. So far as I have been able to ascertain, however, my own experiments and those of v. Leyden and Blumenthal are the only ones up to the present time. In his earlier work v. Leyden used a cancer extract, suitably prepared, so as to guard against infection, while later he resorted to injections of an immune serum, obtained from sheep which had been immunized with cancer. In his report before the international conference for cancer research, at Heidelberg in September, 1906, he expressed himself as much encouraged by his results, and

believes to have demonstrated that a positive cure is possible in inoperable cases, providing that the growth of the tumor has not progressed beyond certain limits. He cites two cases which merit to be more widely known. In the first case, a woman, æt. 64, an inoperable tumor of considerable size was demonstrated at exploratory operation, in the neighborhood of the pylorus, probably starting from the pancreas. The patient was injected with anticancer serum for three months with a resultant gain of 21 pounds in weight and corresponding improvement in her general health and strength. In the second case cancer metastases, secondary to a previously operated cancer of the breast, existed in the 5th-7th dorsal and the 3d lumbar vertebræ, associated with spastic paraplegia. Under the use of anticellular serum, which was begun on July 27, 1904, and continued with intermissions for two years, a distinct improvement was observed, such as diminution in the amount of pain, lessening of the paretic symptoms, improvement of the general health and local changes upon X-ray examination. A cure has of course not been obtained, but it is noteworthy that notwithstanding the wretched condition at the beginning of the injections, the patient is still living two years later, and is in materially better condition.

My own experience is as yet quite limited and the material which is placed at my disposal is by no means ideal, but even so there are cases in which a beneficial effect of the injections is undeniable. A remarkable instance is the following: The patient, a man aged 62, was admitted to the Union Protestant Infirmary, in the service of Dr. Julius Friedenwald, complaining of difficulty in swallowing. This had begun about six months previously and had been progressive, so that he was obliged to give up solid food altogether. He had lost over 40 pounds in weight. Examination with an ordinary stomach tube revealed a stenosis 32.5 cm. from the lower incisors, beyond which the tube could not be passed. In view of the history of the patient and the demonstration of a stenosis the diagnosis of carcinoma of the œsophagus was made. The injections of a cancer vaccine were then begun and continued twice a week, from the 4th of November to the end of December. His weight on November 8th was 126 pounds and on the 15th, 124¾; from that time on he began to gain, and by December 20th, he had reached

132¾—an increase of 8 pounds in five weeks. His strength had also increased very materially, and on December 20th examination by Dr. Friedenwald revealed that the tube which could not be passed at the last examination now passed without any difficulty and that it was possible to pass one of larger calibre. At this juncture the patient developed influenza with bronchopneumonia from which he died, and an autopsy could unfortunately not be obtained.

I hardly think that the diagnosis could have been wrong in this case, and, if correct, then we have before us the fact that a patient who had already lost so much ground could be caused to make a gain, not only in weight and strength, but associated also with a very material change in the local condition, and all this with no other treatment than the injections of the vaccine.

Another instance, I think, deserves some detailed account. This patient was a lady in whom cancer of the breast developed about seven years ago; as she refused the major operation the nodule only was excised at that time, by Dr. Finney. Three years later the axillary glands had become involved and were removed, and again three years later the supraclavicular glands were removed; they were extensively diseased, and it was apparent at the time of the operation (which was also performed by Dr. Finney) that the disease had spread beyond. In order to allow the patient to make whatever gain she could, after the operation, the injections were not begun until three months had elapsed. Her weight at that time was 149½. The injections were given twice a week and continued, with an intermission of about four weeks, for six months. Her weight during this time rose to 161 pounds. At the present time fourteen months have elapsed since the last operation; the patient appears to be in excellent physical health and has held her weight perfectly. Considering the findings at the last operation I cannot help but feel that the injections may be responsible for her good health at this date.

In still another case, a recurrent carcinomatous nodule of the breast could be directly observed to undergo autolysis during the course of the injections.

On the other hand, of course, I have gross failures to record and I have gained the impression that in advanced cases the injections

may actually do harm. My feeling at present is that it would be the better part of wisdom to inject all those cases in which an operation has been performed and to use the patient's own growth whenever this is possible. In non-operative cases a vaccine obtained from some other source may be tried, providing that the disease is in a fairly early stage; in advanced cases no improvement can be expected.

Before leaving this subject it may not be out of place to refer briefly to the interesting experiments of Spiess on the curative treatment of mouse carcinoma by the injection of certain remedies having anæsthetic properties. These experiments are based upon previous observations of the writer on the influence of anæsthesia upon inflammatory processes and certain benign tumors of the larynx (papillomata). Several remedies were tried, but curative results were only obtained with one—paraamidobenzoylpiperidylethanol. Of 74 tumor mice, representing various strains and various generations, a complete cure was obtained as the result of the injections in 22 animals. Small growths were at times resorbed; larger ones only rarely so, while they showed evidence of caseation and calcification; sometimes they ruptured to the outside, with rapidly drying ulceration, while at other times a zone of demarcation was formed and the tumor was thrown off *in toto*. Generally speaking the result was the more favorable the more benign the tumor, and the best results were accordingly obtained in those of slow growth. Rapidly growing carcinomata and sarcomata could be cured only exceptionally. With those animals in which a cure was obtained the question naturally arose whether this was the outcome of the development of an immunity, comparable to what we see when tumors undergo spontaneous resorption, or in the case of mice in which growth has not occurred at all as the result of inoculation. It is interesting to note that this was not the case, for it was possible to obtain new growths in all the animals. These in turn were cured and still no immunity resulted, for on reinoculation they again developed tumors, and the same result was obtained a third time with the same animals.

Analogous experiments in the human being have not yet been made, or if made, have not yet been published. Possibly the toxicity of the substance is such that sufficient quantities could not be used.

This brief outline of recent experimental work dealing with the subject of cancer, in which only the salient features have been presented, shows, I think, that with the introduction of the experimental method a very material advance has been made in our knowledge of some of the more important biological questions which are involved, and a basis has been furnished upon which future research may be profitably pursued. The subject certainly has lost much of its hopeless aspect, and it seems not unreasonable to expect that ere long some of the curative and prophylactic results which can now already be obtained in some of the lower animals, may also become applicable in the human being.

INDEX TO VOLUME II

(EIGHTEENTH SERIES)

A

- Abscess in children, perinephritic, 188
- Acne vulgaris, vaccination treatment of, 44
- Albuminuric retinitis after pregnancy, 235
- Amblyopia, angiospastic, treatment of, 123
 - of angiospastic origin, 111
- Angina pectoris, 120
- Angiospastic amblyopia, 111
- Antidysenteric serum, 49
 - disadvantages of, 53
- Antitoxin in scarlet fever, 8
- Arsenic, preventive and curative treatment of syphilis with, 20
- Asthenopia due to unpleasant odors, 239
- Astigmatism, high, 242
 - myopic, 242
- Athletics and heart disease, 77
- Atoxyl in the treatment of syphilis, 12
 - poisoning, 15

B

- Bacillary dysentery, serum treatment of, 48
- Bacillus coli communis vaccination, 41
- Bacterial vaccines, treatment with, 23
- Behan, Richard J., The changes in the outlines of the heart, diaphragm and stomach during the phases of respiration as illustrated by the X-ray, 62
- Blindness of one eye unsuspected for 40 years, 240
- Blood in stools of intestinal carcinoma, 157
- Bones, tuberculosis of, treatment with vaccines, 39
- Bronchitis, subacute, 262
- Buchanan, Leslie, The vision in some eye diseases, 235

C

- Carcinoma of colon, early symptoms of, 156
 - of large intestine, 155
 - of uterus, 176
 - of uterine cervix, 177
 - pathology of, 286
 - vaccine, 297

- Cataract extraction, after-treatment of, 224
 - membranous or secondary, 238
- Cecil, John C., Valvular heart disease, 74
- Cerebrospinal meningitis, epidemic, vaccine treatment of, 42
- Cervix of uterus, carcinoma of, 177
 - gonorrhoeal infection of, during conception, 204
- Children, perinephritic abscess of, 188
- Chorio-retinitis, 238
- Cicatrix, cystoid, after cataract extraction, 234
- Colon, carcinoma of, early symptoms of, 156
- Conception and gonorrhoea, 203
- Constipation in intestinal carcinoma, 158
- Cornea, staphyloma of, 180
- Cumston, Charles Greene, Perinephritic abscess in children, 188

D

- Deaderick, William H., The treatment of hæmoglobinuric fever, 54
- Delirium after cataract extraction, 231
- Diaphragm, changes in outline of, during respiration, 62
- Diarrhoea in intestinal carcinoma, 156
- Diller, Theodore, Pain as the chief or sole expression of a psychic state; with illustrative cases, 86
- Dislocation of lens, 241
- Dopter and Vaillard, The serum treatment of bacillary dysentery, 48
- Dysentery, serum treatment of bacillary, 48

E

- Ear, suppurative inflammation of, in scarlet fever, 10
- Ectropion of lower eyelid, operative treatment of, 124, 130
- Eczema complicating varicose veins, 167
- Empyema in scarlet fever, 10
- Entropion of lower eyelid, 230
- Eye, diseases of, vision in, 235
 - foreign body in, 238
- Eyelid, ectropion of lower, operative treatment of, 124, 130
 - entropion of lower, 230

F

- Face, reconstructive operations of, 124
 Fallopian tubes, gonorrhœa of, 204
 Fecal impaction, 159
 Feces, examination of, 161
 Fever in scarlet fever, treatment of, 5
 Fibroid of uterus and pregnancy in a hemiplegic, 211
 Fischer, Louis, The treatment of scarlet fever, including prophylactic measures necessary to prevent complications, 1
 Foreign body in eye, 238
 Frank, Louis, Pregnancy complicated by uterine fibromata in a hemiplegic, 211

G

- Gilbert, Richard B., Marasmus; inherited syphilis; subacute bronchitis, 262
 Gonorrhœa and pregnancy, 202
 Gotthell, William S., Rhinoscleroma, 244
 Gruber, R. and Weber, F. Parkes, Corrected recurrent temporary amblyopia of angiospastic origin and the association of retinal angiospasm with other vasomotor neuroses, 111

H

- Hæmoglobinuric fever, treatment of, 54
 Hallopeau, H., Treatment of syphilis by atoxyl, 12
 Heart, contraction waves of, 70
 changes in outline of, during respiration, 62
 complications in scarlet fever, 3
 disease, valvular, 74
 treatment of, 84
 position of apex of, 71
 Hemioptia, functional, 240
 Hemiplegic, pregnancy and uterine fibroid in a, 211
 Hemorrhage, intraocular, after worry, 243
 in uterine carcinoma, 178
 Hudson, H., Congenital scoliosis. Report of a case showing supernumerary ribs and vertebrae, and other deformities, with radiograms, 258
 Hypernephromata, malignant renal, with consideration of their chemical characteristics, 272
 Hysteria, traumatic, 90
 Hysterical pain, 87

I

- Intestines, carcinoma of large, 155
 obstruction of, 158
 tuberculosis of, treatment with vaccine, 41

- Intraocular hemorrhage, 248
 Iridotomy, 227
 Iris, prolapse of, 229
 Iritis after cataract extraction, 227

J

- Joints, tuberculosis of, treatment with vaccine, 89

K

- Keratitis, striped, 231
 Keratoconus, 242
 Kidney, abscess around, 188
 malignant hypernephroma of, 272
 tuberculosis of, treatment with vaccine, 88

L

- Lachrymal complications of cataract operations, 232
 Laxatives in scarlet fever, 6
 Lead poisoning, some curiosities of, 99
 sources of, 108
 Leg, varicose ulcers and veins of, treatment of, 164
 Lens, dislocation of, 241
 Leucorrhœa in carcinoma uteri, 190
 Lid, entropion of lower, 230
 Lungs, tuberculosis of, treated with vaccine, 28
 Lupus of skin, treatment of, with vaccine, 40
 Lymphadenitis, in scarlet fever, 9
 Lymph glands, inflammation of, in scarlet fever, 9
 tuberculosis of, treated with vaccine, 86

M

- Malignant disease, recent research into the pathology of, 286
 Marasmus, 262
 Meningitis, epidemic cerebrospinal, treatment with vaccine, 42
 Menopause, symptoms of, 215
 Mental disturbance, pain as the sole expression of, 86
 Moore, William Oliver, The after-treatment of cataract extraction, 224
 Mucus in stools of intestinal carcinoma, 157
 Mummery, P. Lockhart, The symptoms and diagnosis of cancer of the large intestine, 156
 Myopia, 241
 Myopic astigmatism, 242

N

Necrosis of nose, syphilitic, 133
Needling in secondary cataract, 232
Neuritis, optic, 237
Neuroretinitis, albuminuric, 236
Neuroses, vasomotor, 111
Nose, congenital absence of, 137
reconstructive operations of, 133
of ala of, 124

O

Obstruction, intestinal, 158
Opsonic estimation in various infections, 25
Optic neuritis, 237
Otitis purulenta in scarlet fever, 10

P

Pain, the sole expression of a psychic state, 86
Perinephritic abscess in children, 138
Peristalsis, reversed, seen with Roentgen rays, 63
Peritoneum, gonorrhoeal inflammation of, 205
Plastic operations of the face, 124
Pleura, tuberculosis of, treated with vaccine, 28
Pregnancy, albuminuric retinitis after, 235
and gonorrhoea, 202
and uterine fibroid, 211
signs of, 219
Puerperium and gonorrhoea, 207
Pyæmia, vaccination treatment of, 45
Pyelonephritis, 144

R

Raynaud's disease, 115
Rectum, examination of, 160
Retina, angiospasm of, 111
Retinitis after pregnancy, albuminuric, 235
Rhinoplasty for deformity due to syphilitic ulceration and necrosis, 133
Rhinoscleroma, 244
Ribs, supernumerary, 255
Roberts, John B., Clinical lecture on reconstructive surgery of the face, 124
Roentgen picture of congenital scoliosis with supernumerary ribs and vertebrae and other deformities, 253
Roentgen rays in rhinoscleroma, 251
rays to outline the heart, diaphragm and stomach during respiration, 62

S

Sampson, John A., The clinical manifestations of uterine cancer, 176
Sarcoma, pathology of, 292
Scarlet fever, cardiac complications in, 3
mortality of, 8
prevention of complications of, 1
treatment of, 1, 5
Scoliosis, congenital, with supernumerary ribs and vertebrae and other deformities, 253
Septicæmia, vaccination treatment of, 45
Serum treatment in dysentery, technique of, 51
of bacillary dysentery, 48
Simon, Charles E., Recent research into the pathology of malignant disease, 286
Skin, lupus of, treated with vaccine, 40
Staphylococcus vaccine, 44
Staphyloma of cornea, 140
Stomach, changes in outline of, during respiration, 62
measurements of, 65
Streptococcus vaccine, 43
Syphilis, inherited, 262
treatment of, by atoxyl, 12
Syphilitic ulceration and necrosis, rhinoplasty for deformities due to, 133

T

Toxæmia in carcinoma uteri, 180
Tuberculin treatment, technique of, 24
varieties of, 23
Tuberculosis of bones and joints, treated with vaccine, 39
of intestines, treated with vaccine, 41
of kidneys, treated with vaccine, 38
of lungs and pleura, treated with vaccine, 28
of lymph glands, treated with vaccine, 36
of skin, treated with vaccine, 40
Turton, Edward, Two years' experience of treatment by the inoculation of bacterial toxins, 23

U

Ulceration of nose, syphilitic, 133
Uterus, carcinoma of, 176
fibroid of, and pregnancy in a hemiplegic, 21
gonorrhoea of, 204

V

Vaccine, carcinoma, 297
Vaccines, treatment with bacterial, 23

Vaginitis in scarlet fever, suppurative, 10
 Vaillard and Dopter, The serum treatment
 of bacillary dysentery, 48
 Valvular heart disease, 74
 treatment of, 84
 Varicose ulcers of leg, treatment of, 164
 veins of leg, treatment of, 164
 Vasomotor neuroses, 111
 Vertebrae, supernumerary, 255
 Vision in eye diseases, 235
 Vitreous, prolapse of, 230
 Vulvovaginitis, gonorrhœal, 203

W

Walsh, James J., Some curiosities of lead
 poisoning, 99

Weber, F. Parkes and Gruber, E., Cor-
 rected recurrent temporary amblyopia
 of angiospastic origin and the associa-
 tion of retinal angiospasm with other
 vasomotor neuroses, 111
 Wells, H. Gideon, Atypical forms of ma-
 lignant renal hypernephromata with
 consideration of their chemical char-
 acteristics, 272
 Willmoth, Argus D., Treatment of vari-
 cose ulcer and varicose veins of the leg,
 164

Y

Yeast, brewer's, in varicose ulcers, 173
 Young, Ernest Boyen, Gonorrhœa and
 pregnancy, 202

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41A

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41

